

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 1 of 304
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# PARAMEDIC PROTOCOL GUIDELINES

## EL PASO COUNTY EDITION Updated 2010

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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 2 of 304
---	-----------------------	------------------------------

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**Table of Contents**

MODIFICATIONS (UPDATED 12/10) ..... 9

EL PASO COUNTY GUIDELINES ..... 11

    GENERAL GUIDELINES FOR RESPONSE TO EMERGENCY CALLS ..... 12

    DESTINATION GUIDELINES El Paso COUNTY MEDICAL SOCIETY ..... 15

        Patient Destination Guidelines for Memorial North ..... 15

        Patient Destination Guidelines for St. Francis Medical Center ..... 15

    SPECIFIC GUIDELINES ..... 16

        CRITICAL CARE DIVERT ..... 18

        TOTAL AMBULANCE DIVERT ..... 19

CHAPTER 1 PREHOSPITAL PATIENT ASSESSMENT ..... 21

    INTRODUCTION ..... 22

    INITIAL PATIENT ASSESSMENT – (MEDICAL AND TRAUMA PATIENT) ..... 24

    DETAILED PHYSICAL EXAM – (TRAUMA PATIENT ASSESSMENT) ..... 26

    DETAILED PHYSICAL EXAM – (MEDICAL PATIENT ASSESSMENT) ..... 28

    PATIENT HISTORY – (MEDICAL AND TRAUMA PATIENT) ..... 29

    PEDIATRIC PATIENT ASSESSMENT ..... 31

        TABLE 1.1 NORMAL VITAL SIGNS IN THE PEDIATRIC AGE GROUP ..... 32

    NEUROLOGIC ASSESSMENT ..... 33

        TABLE 1.2 Glasgow Coma Score ..... 33

        TABLE 1.3 Cincinnati Stroke Scale ..... 34

    TRIAGE: MULTIPLE PATIENT ASSESSMENT ..... 35

    DEATH IN THE FIELD ..... 38

CHAPTER 2 MEDICAL TREATMENT PROTOCOLS ..... 41

    INTRODUCTION TO TREATMENT PROTOCOLS ..... 43

    ABDOMINAL PAIN ..... 44

    ALLERGY/ANAPHYLAXIS ..... 45

    ALTERED MENTAL STATES/BEHAVIORAL PROBLEMS ..... 47

    CARBON MONOXIDE EXPOSURE ..... 49

    CARDIAC ARREST ..... 50

    CHEST PAIN ..... 51

    CHILDBIRTH ..... 53

    COMA ..... 55

    DYSRHYTHMIAS: GENERAL ..... 56

    DYSRHYTHMIAS: TACHYCARDIA ..... 58

    DYSRHYTHMIAS: NORMAL RATE ..... 59

    DYSRHYTHMIAS: BRADYCARDIA ..... 60

    HYPOTHERMIA ..... 61

    NEUROLOGIC DEFICIT ..... 62

    POISONS AND OVERDOSES ..... 63

    RESPIRATORY DISTRESS ..... 65

        Table 2.1 BREATH SOUNDS IN RESPIRATORY DISTRESS ..... 67

    SEIZURES ..... 68

    SHOCK: MEDICAL ..... 70

    SYNCOPE ..... 71

    VAGINAL BLEEDING ..... 72

    VOMITING OR DIARRHEA ..... 73

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 4 of 304
---	-----------------------	------------------------------

CHAPTER 3 PEDIATRIC TREATMENT PROTOCOLS .....75

    PEDIATRIC TREATMENT OVERVIEW .....77

    INFANT AND CHILD RESUSCITATION .....78

    NEONATAL RESUSCITATION .....80

    PEDIATRIC RESPIRATORY DISTRESS .....82

    PEDIATRIC SEIZURES .....84

    PEDIATRIC TABLES .....85

        Table 3.1 APGAR SCORE .....85

        Table 3.2 NORMAL VITAL SIGNS IN THE PEDIATRIC AGE GROUP .....86

        Table 3.3 PEDIATRIC AIRWAY SIZES .....86

        Table 3.4 PEDIATRIC TREATMENT REFERENCE .....87

CHAPTER 4 TRAUMA TREATMENT PROTOCOLS .....89

    MULTIPLE TRAUMA OVERVIEW .....91

    ABDOMINAL TRAUMA .....94

    AMPUTATION .....95

    CHEST INJURY .....96

    EXTREMITY INJURIES .....98

    FACE AND NECK TRAUMA .....100

    HEAD TRAUMA .....102

    SHOCK: TRAUMATIC .....105

    SPINAL TRAUMA .....107

    SPECIAL TRAUMA PROBLEMS .....109

        SEXUAL ASSAULT .....109

        CHILD ABUSE/NEGLECT .....109

        PREGNANT TRAUMA PATIENT .....110

        TRAUMA ARREST .....110

CHAPTER 5 ENVIRONMENTAL TREATMENT PROTOCOLS .....111

    BITES AND STINGS .....113

    BURNS .....115

    DECOMPRESSION/DIVING INJURY .....118

    DROWNING .....119

    HIGH ALTITUDE ILLNESS .....120

    HYPERTHERMIA .....121

    HYPOTHERMIA AND FROSTBITE .....122

    SNAKE BITES .....124

CHAPTER 6 HAZARDOUS MATERIALS PROTOCOLS .....125

    INTRODUCTION .....127

    INCIDENT COMMAND ORGANIZATION .....128

    APPROACH TO HAZARDOUS MATERIALS .....129

        GUIDELINES FOR HAZARDOUS MATERIALS RESPONSE .....129

    MEDICAL MONITORING .....132

    GENERAL MEDICAL APPROACH .....134

    ACETYL CHOLINESTERASE INHIBITORS .....135

    CYANIDE .....138

    METHEMOGLOBINEMIA .....141

    SULFIDES .....144

    FLUORIDE .....146

    HYDROCARBONS .....148

CHAPTER 7 PREHOSPITAL PROCEDURES .....151

    BASIC AND ADVANCED .....151

        INTRODUCTION .....153

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 5 of 304
---	-----------------------	------------------------------

ADVANCED CARDIAC MONITORING .....	154
12-LEAD ELECTROCARDIOGRAM (ECG).....	154
AIRWAY MANAGEMENT .....	155
GENERAL PRINCIPLES .....	155
OPENING THE AIRWAY.....	157
OBSTRUCTED AIRWAY.....	159
CLEARING AND SUCTIONING THE AIRWAY .....	161
ASSISTING VENTILATION .....	163
ADVANCED AIRWAY MANAGEMENT .....	165
ALTERNATE AIRWAYS .....	165
CRICOTHYROTOMY.....	166
DIFFICULT AIRWAY .....	169
NASOTRACHEAL INTUBATION.....	172
ONE – TIME USE DISPOSABLE VENTILATOR (SUREVENT) .....	173
OROTRACHEAL INTUBATION.....	175
TABLE 6.1 OROTRACHEAL TUBE SIZE .....	178
RAPID SEQUENCE INTUBATION (RSI).....	179
ADVANCED AIRWAY MONITORING.....	181
ESOPHAGEAL DETECTION DEVICE (EDD) .....	181
PEAK EXPIRATORY FLOW TESTING.....	183
PULSE CO-OXIMETRY .....	184
PULSE OXIMETRY .....	185
QUANTITATIVE END-TIDAL CO2 MONITORING CAPNOMETRY AND CAPNOGRAPHY .....	186
BANDAGING .....	188
CARDIOVERSION.....	189
CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP).....	191
DEFIBRILLATION .....	193
FOLEY CATHETER INSERTION.....	194
ICD MAGNET (IMPLANTABLE CARDIOVERTER DEFIBRILLATOR).....	196
IMPEDENCE THRESHOLD AIRWAY DEVICE IN CPR (ResQPOD).....	198
INTRAOSSEOUS CANNULATION .....	199
MEDICATION ADMINISTRATION .....	201
INTRAVENOUS INJECTION TECHNIQUE.....	201
INTRAMUSCULAR INJECTION TECHNIQUE.....	201
SUBCUTANEOUS INJECTION TECHNIQUE .....	202
NEBULIZATION TECHNIQUE .....	202
OCULAR TECHNIQUE.....	202
INTRANASAL TECHNIQUE.....	202
INTRAOSSEOUS TECHNIQUE.....	202
EYE IRRIGATION LENS .....	204
NASOGASTRIC INTUBATION.....	205
PAIN MANAGEMENT .....	206
PERIPHERAL IV LINE INSERTION.....	207
EXTREMITY .....	207
EXTERNAL JUGULAR VEIN.....	208
SCALP VEIN .....	208
SALINE LOCK.....	209
MEDICATION ADMINISTRATION .....	211
UTILIZING A PREEXISTING VASCULAR ACCESS DEVICE (PVAD) .....	211
RESTRAINT .....	213
SPLINTING: AXIAL.....	215
PELVIC COMPRESSION DEVICE (EPCD).....	218
SPLINTING: EXTREMITY .....	220
EXTREMITY SPLINTING TECHNIQUE.....	220
TRACTION SPLINTING TECHNIQUE.....	220

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 6 of 304
---	-----------------------	------------------------------

TENSION PNEUMOTHORAX DECOMPRESSION.....222

CHAPTER 8 PREHOSPITAL MEDICATIONS .....225

    INTRODUCTION TO PREHOSPITAL DRUGS.....227

    ADENOSINE (ADENOCARD).....228

    ALBUTEROL .....229

    AMIODARONE (CORDARONE).....230

    ASPIRIN (ACETYLSALICYLIC ACID).....231

    ATROPINE .....232

    BENZOCAINE, 20% TOPICAL AEROSOL .....234

    BENZODIAZEPINES .....235

    CALCIUM.....236

    CHARCOAL .....237

    DEXTROSE (Intravenous).....239

    DEXTROSE (ORAL).....240

    DILTIAZEM (CARDIZEM).....241

    DIPHENHYDRAMINE (BENADRYL).....242

    DOPAMINE (INTROPIN).....243

        Table 7.1 INTRAVENOUS DRIP RATES FOR DOPAMINE.....244

    EPINEPHRINE .....245

    ETOMIDATE.....247

    FENTANYL (SUBLIMAZE).....249

    FUROSEMIDE (LASIX) .....251

    GLUCAGON.....252

    HALDOL (HALOPERIDOL) .....253

    HEPATITIS B VACCINE (RECOMBINANT).....254

    INFLUENZA VIRUS VACCINE .....255

    IPRATROPIUM BROMIDE (ATROVENT).....256

    IV SOLUTIONS.....257

    LIDOCAINE (XYLOCAINE).....259

    LIDOCAINE VISCOUS .....262

    MAGNESIUM SULFATE .....263

    METERED DOSE INHALERS (MDI).....264

    MORPHINE SULFATE (MS) .....266

    NALOXONE (NARCAN).....268

    NITROGLYCERIN.....269

    ONDANSETRON (ZOFRAN).....270

    OXYGEN .....271

    PHENYLEPHRINE (NEO-SYNEPHRINE).....272

    RACEMIC EPINEPHRINE (VAPONEFRIN).....273

    SODIUM BICARBONATE .....274

    SUCCINYLCHOLINE (ANECTINE) .....275

    TETANUS-DIPHThERIA VACCINE (Td) .....276

    TOPICAL OPHTHALMIC ANAESTHETICS.....277

    TUBERCULIN PPD, DILUTED .....278

    VASOPRESSIN .....279

    VECURONIUM BROMIDE (NORCURON).....280

    VERAPAMIL.....281

CHAPTER 9 OPERATIONAL PROCEDURES .....283

    COMMUNICATION PROCEDURE.....285

    PREHOSPITAL MEDICAL RECORDS (TRIP REPORT).....286

        SOAP.....287

        CHART.....288

    DETOXIFICATION CENTER EVALUATION PROTOCOL.....289

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 7 of 304
---	-----------------------	------------------------------

CUSTOMER SERVICE .....290

PROFESSIONAL IDENTITY .....291

INFECTIOUS DISEASES .....294

INTERHOSPITAL TRANSFER.....295

LEGAL PROBLEMS .....296

PATIENT REFUSALS.....298

PHYSICIAN ON SCENE.....299

PHYSICIAN RESPONSIBILITY AT THE SCENE.....301

PHYSICIAN ORDERS FOR EXTRAORDINARY CARE THAT ARE NOT COVERED UNDER CURRENT  
PROTOCOL .....302

ABBREVIATION KEY .....303

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 8 of 304
---	-----------------------	------------------------------

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<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 9 of 304</p>
---	-------------------------------	---------------------------------------

**Modifications (updated 12/10)**

May 2010

- Removed Labetalol and Pronestyl from list of advanced drugs suitable for standing–order in some circumstances OR direct–order administration (p 225)
- Removed diazepam protocol. Replaced with benzodiazepine protocol (p 234)
- Removed midazolam protocol. Replaced with benzodiazepine protocol (p 234)

July 2010

- Removed references to used of Pelvic Compression Device for hip fractures or dislocations (p 217)
- Removed direct physician contact for second dose of fentanyl. Additional doses do required contact with physician. (p 249)
- Added “calcium channel blocker” overdose to Glucagon administration (p 251)
- Added intraosseous anesthetization as an indication for Lidocaine (p 259)
- Added separate indications for the use of Continuous Positive Airway Pressure (CPAP) for CHF/COPD and Asthma. (p 190)
- Added protocol for Vasopressin. (p 279)

November 2010

- Modified dose for fentanyl to read “0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order)” (pgs 51, 59, 61, 102, 113, 115, 180, 190, 206, and 249)

December 2010

- Pelvic Compression Device – Changed from contraindicated to non-indicated for suspected isolated hip fractures or dislocations. (p 218)

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 10 of 304
---	-----------------------	-------------------------------

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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 11 of 304
---	-----------------------	-------------------------------

# EL PASO COUNTY GUIDELINES

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 12 of 304</p>
--	-------------------------------	--

## **GENERAL GUIDELINES FOR RESPONSE TO EMERGENCY CALLS**

1. Receiving the call
  - A. Information needed:
    - Name of caller
    - Call-back number and name
    - Name of patient(s)
    - Age
    - Nature of problem
    - Location/address
  
2. Assessment of the scene of the accident
  - A. Assist fire, police, and other personnel in creating a safe environment for the evaluation and treatment of the injured person(s). Pay particular attention to continuing medical dangers, especially toxic gases, which may jeopardize rescue personnel.
  - B. Remove patients using prescribed techniques. In the case of multiple victims consider designation of a safe triage area for assessment and stabilization of victims.
  - C. Be particularly cautious of potentially hazardous scenes. Accidents involving toxic chemicals can contaminate (and kill) rescuers as well as original patients. Stay back from hazardous scenes and work with Hazardous Materials crew to determine when the scene is safe or when the patients will be removed to safety.
  
3. Assessment of patients (quick)
  - A. Review patient rapidly, assessing the extent of their injuries and assigning a triage category
    1. Red – critical (requiring treatment within minutes)
    2. Yellow – serious (treatment within 1-2 hours).
    3. Green – non-life-threatening injuries (treatment delayed for several hours)
    4. Black – dead at scene
  - B. Ambulances should deliver patients to the hospital of the patient’s choosing, or as directed by the patient’s physician or a member of the patient’s immediate family. In life-threatening situations with no stated preference ambulances may transport to the nearest civilian hospital capable of rendering appropriate care to the patient’s needs. Where possible the ambulance crew shall consult with an Emergency Physician through direct voice communications. In cases where the ambulance technician has established continuing communication with a physician and has received instruction relative to the care and treatment of the patient, that physician shall be considered as the “patient’s physician” for purposes of prehospital care. In all non-life-threatening cases where a preference is not expressed the ambulance shall deliver patients to the nearest civilian hospital with a fully staffed Emergency Department.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 13 of 304</p>
--	-------------------------------	--

4. Assessment of patient (full)

See assessment protocols. Assessment should begin with critical (red) patients, and proceed to those with lesser injuries. Do not waste time on CPR if there are other patients in need of care in a multi-patient incident.

5. Stabilization

A. After assessment, establish priorities for required emergency care before transport. Render emergency care as defined by protocols and as directed by base station or receiving physician.

B. The protocols of medical hierarchy will be followed (EMT, Paramedic trainee, Paramedic, Emergency Nurse, and Physician). When two persons with the same qualifications arrive at the same time, the first to render care to the patient will assume responsibility of medical control until relieved by a person with higher qualifications.

C. A physician wishing to take responsibility for a patient on the scene must identify themselves as a physician and should be able to show his license; otherwise, the Paramedics are obligated to continue their treatment of the patient. If the physician assumes responsibility for the patient it is their responsibility to stay with the patient until arrival at the hospital, preferably in the transporting vehicle. If there are conflicts between physician orders and protocols, protocols shall take precedence pending direct communication with the base physician.

D. Decide with the help of base station physician when stabilization efforts have attained maximal results and the patient should be transported. Prolonged treatment on the scene (more than 15 minutes or the first round of drugs of the cardiac arrest protocol) should only be accomplished with direct physician approval. This time limit may be modified because of extrication difficulties and transport distance (i.e., are you two minutes or two hours from the receiving hospital?), but if direct radio contact is not available, transport must be prompt. Further, it should be emphasized, that time spent on “stabilization” of the medical patient in the field may be justified, but the major trauma patient must have minimal time spent on field treatment and requires rapid transport for definitive care.

6. Communications

A. Notify receiving hospital of the number of patients and extent of injuries (more complete than just triage categories – unless actual disaster).

B. Coordinate efforts with other professional personnel at the scene to make maximal use of all those with training to stabilize and transport patients.

C. Relatives on the scene should be told briefly and courteously the status of the patient in your judgment, and the location to which the patient will be transported.

D. Bystanders should be treated courteously, but without waste of time. Inquiries should be referred to the receiving hospital. Bystanders have no right to medical information, and you have no authority to give it out. Law enforcement officials should be used to dispense appropriate information at the scene.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 14 of 304
---	-----------------------	-------------------------------

- E. In the event of an emergency which threatens the well being of the Paramedic (i.e., a suddenly violent patient) the police can be notified to meet your vehicle at the hospital by contacting dispatch.
7. Transportation
- A. Remove and transport patients from the scene in order of the severity of their injuries, according to the triage assignment and subsequent course on the scene.
  - B. Stabilization and advanced life support at the scene should result in a great number of patients who are stable and can be transported without red lights and sirens. Lights and sirens are technically risky as well as stressful to the patient and should be reserved for uncontrolled and unstable situations.
  - C. Patients have the right to refuse transport if they have appropriate mental capacity and are adults. If direct radio communication with hospital is available; permission not to carry should come from the resource hospital or from the patient's physician. Often direct communication between patient and physician will clarify the issues.
  - D. Observe and monitor the patient en route to the hospital, monitor vital signs, and administer additional care as directed by the base station or receiving physician.
8. Termination of run
- A. Report your observations and care of patient to the Emergency Department staff.
  - B. All pertinent observations and all treatment must be recorded on standard patient care report forms. These forms must be reviewed by the receiving physician and should be made a part of the permanent medical record. Medication orders should have the signature of the ordering physician on the trip form.
  - C. All PCR forms must be reviewed under the system set up by the physician advisor. All runs involving new drugs or procedures must be specifically reviewed by the physician advisor as well as the receiving physician.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 15 of 304
---	-----------------------	-------------------------------

## **DESTINATION GUIDELINES El Paso COUNTY MEDICAL SOCIETY**

As of: May 21, 1990 Revised June 30, 2009

Whenever possible ambulances shall deliver patients to the hospital of choice according to the patient/immediate family/physicians request provided that request is appropriate to on scene medical control.

In life-threatening situations, ambulances may contact and/or transport to the nearest civilian hospital capable of rendering the appropriate level of care for the patient's needs.

Patients without a hospital preference should be transported to the closest, most appropriate civilian hospital.

When necessary, responsibility for determining patient destination lies with the on-scene medical control.

### Exception

1. In multi-casualty incidents, the destination responsibility lies with the Medical Supervisor on scene, or, if appointed, the Transportation Unit Leader or Group Supervisor.
2. Police may determine hospital destination for individuals in custody or under arrest if not seriously ill or injured. In serious or critical situations, patients will be transported to the most appropriate facility, (CSPD General Order, May 6, 1988).
3. Trauma patients meeting the criteria for transport to a trauma center must be taken to an appropriate trauma center designated pursuant to the Statewide Trauma Care System Act.

*NOTE: Trauma patients requiring a trauma team are expected to be transported to the nearest trauma center. Exceptions are outlined in the specific guidelines.*

### **Patient Destination Guidelines for Memorial North**

**(Patients that cannot be accepted – see Specific Guideline Section for more detail)**

- Prefer *not* to accept STEMI or chest pain patients likely to require urgent catheterization.
- Trauma patients meeting the criteria in the attached El Paso County Trauma Triage Decision Scheme

### **Patient Destination Guidelines for St. Francis Medical Center**

**(Patients that cannot be accepted – see Specific Guideline Section for more detail)**

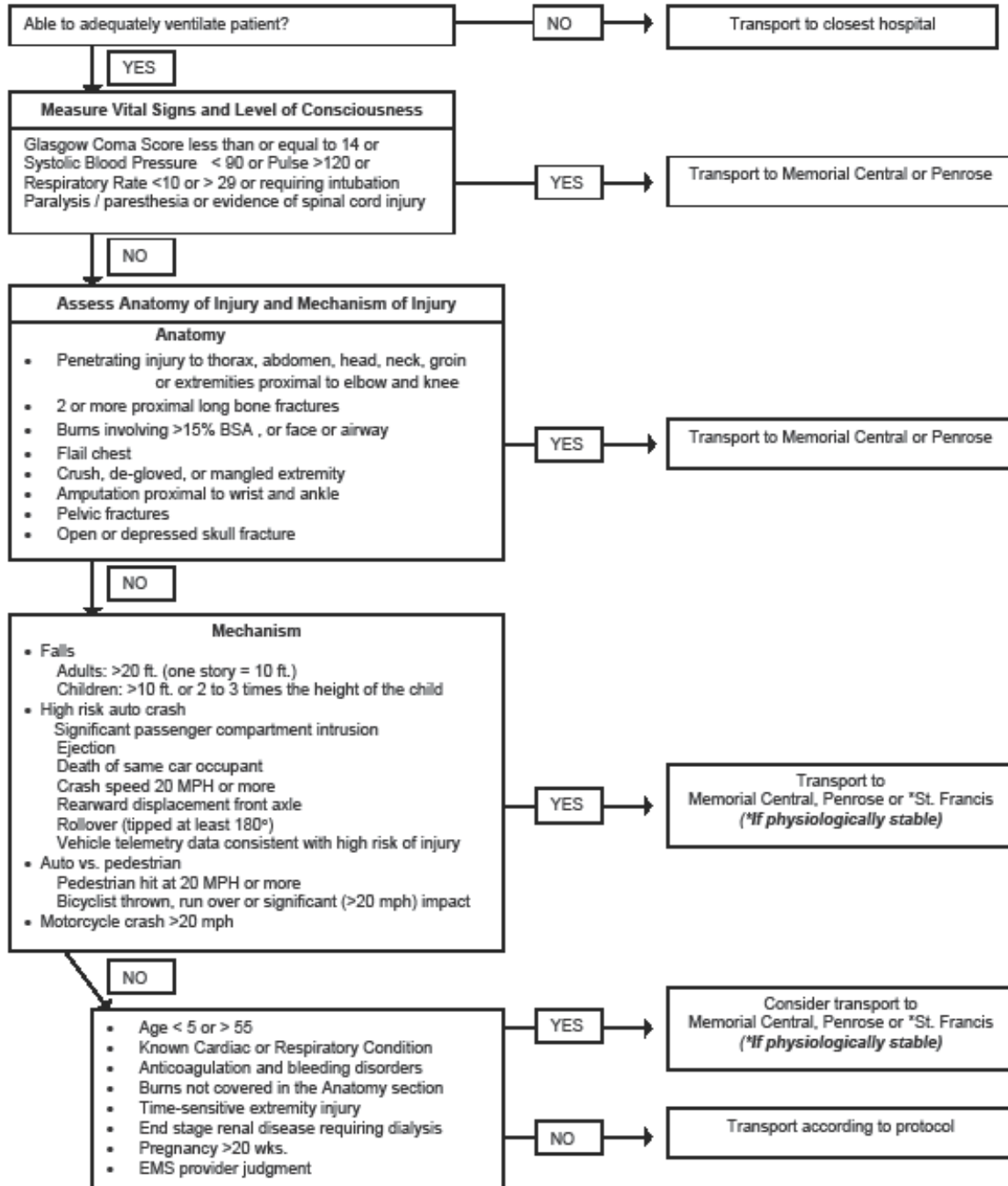
- Trauma patients exceeding Level IV Trauma Destination Criteria in the attached El Paso County Trauma Triage Decision Scheme

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 16 of 304</p>
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## **SPECIFIC GUIDELINES**

1. Seriously ill neonates up to 44 weeks post menstrual age should be taken to Memorial Central, Memorial North, or St. Francis Medical Center. Seriously injured neonates should be taken to Memorial Central.
2. Seriously ill children less than 15 years of age who are likely to require treatment in an intensive care unit should be taken to Memorial Central.
3. Critically ill adults (15 years of age or greater) may be transported to Memorial Central, Penrose Main, or St. Francis Medical Center.
4. All serious burn victims should go to the closest, appropriate designated trauma center.
5. Patients with suspected symptomatic carbon monoxide poisoning should go to Memorial Central.
6. Children less than 15 years of age with critical injuries, as defined by the American College of Surgeons (see attached triage decision scheme), should be transported to Memorial Central.
7. Patients 15 years of age or older with critical injuries, as defined by the American College of Surgeons (see attached triage decision scheme), should be transported to either Penrose Main or Memorial Central Hospital.
8. Complications of pregnancy, regardless of gestational age, including prolapsed cord, Pregnancy induced hypertension/eclampsia, or premature labor can be transported to Memorial Central, Memorial North, or St. Francis Medical Center.
9. Patients with acute psychiatric problems (or intoxicated patients not eligible for detox) can be transported to Penrose Main Hospital Memorial Central, Memorial North, or St. Francis Medical Center.
10. Patients with symptoms consistent with a STEMI should be transported to the closest acute care facility with cardiac catheterization lab capability – currently Memorial Central, Penrose Main, and St. Francis Medical Center.
11. When a hospital is on divert status, patient should be taken to the next most appropriate hospital. If all hospitals are on divert – facilities are then required to accept patient as if they are not on divert.

## EL PASO COUNTY TRAUMA TRIAGE DECISION SCHEME



**WHEN IN DOUBT, TAKE TO A TRAUMA CENTER**  
(Modified American College of Surgeons, Committee on Trauma, Resource document)

October 2008, EPCMS  
Final for review of hospital destination guidelines

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 18 of 304
---	-----------------------	-------------------------------

## **EL PASO COUNTY PARAMEDIC AMBULANCE DIVERT POLICY**

### **PREFACE**

Recognizing the need for a uniform diversion policy for the Colorado Springs hospitals when these facilities are stressed under particular conditions, the following policy and guidelines are proposed.

### **TYPES OF DIVERT**

#### **CRITICAL CARE DIVERT**

- A. Medical Critical Care Divert – Patients in this category would include those with serious medical problems whose in-hospital care would, in all probability, require intensive care management. Examples would include, but not be limited to, cardiac arrest, shock, coma, or chest pain of a suspected etiology requiring intensive care facilities. The hospital has determined itself unable to safely accommodate additional patients requiring these facilities.
  1. Sub-categories
    - a. Adult
    - b. Pediatric (less than 15)

*(A sub-category under medical divert could also be utilized by those institutions that have specific intensive care facilities such as Peds, or ICU at such times that their capabilities are similarly over burdened.)*
- B. Trauma Critical Care Divert – Patients in this category would include those with major trauma, whose continued management carries a high probability of requiring emergency surgery. Examples would include, but not be limited to, penetrating injuries of the chest, abdomen, or head, massive blunt head injury, or major multisystem trauma. The intent of a trauma divert would be to redirect these patients to other appropriate facilities when a particular hospital has maximally utilized its surgical operating facilities at a given period of time.
  1. Sub-categories
    - a. Adult
    - b. Pediatric (less than 15)
- C. CT Scan Divert – Patients in this category would include those with major trauma, acute intercranial pathology whose evaluation or management would include an urgent or emergent CT scan. Examples would include but not limited to blunt trauma to the head, possible acute cerebral vascular accident or status epilepticus.
- D. Total Critical Care Divert
  1. Sub-categories
    - a. Adult
    - b. Pediatric (less than 15)

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 19 of 304</p>
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## **TOTAL AMBULANCE DIVERT**

Total Ambulance Divert – Under this condition all patients being transported by ambulance would be redirected to other facilities in the event that any particular hospital or its emergency department found itself maximally utilized and unable to accommodate additional patient load without compromising quality care.

A hospital could indeed be on both Critical Care Divert and Trauma Divert but still is capable of receiving ambulance traffic bearing patients not requiring the intensive care facilities outlined above under sections A and B. That is, a hospital could declare both critical care and trauma divert status without being on Total Ambulance Divert status.

We recommend that *responsibility* for designating and initiating a divert status at any hospital *should be that of the emergency physician* on duty at that institution. The decision to go on divert may be made in conjunction with nursing supervisory staff and/or hospital's administration, but notification of the hospital's divert status shall be directed by the emergency physician in charge of the department at such time.

Any divert will be initiated and terminated by contacting/updating

**EM System  
The Other Hospital System**

Any divert will be updated every 8 hours.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 20 of 304
---	-----------------------	-------------------------------

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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	<b>Document # 04-2010</b>	<b>Rev.: Page #: 21 of 304</b>
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**CHAPTER 1**

**PREHOSPITAL PATIENT ASSESSMENT**

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 22 of 304</p>
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## INTRODUCTION

Patient assessment in the field and in the Emergency Department is performed differently than assessment in a conventional medical setting. The routine hospital evaluation of a patient works logically through history-taking, physical examination, gathering of laboratory data, confirmation of a diagnosis, and initiation of treatment. In comparison, emergency assessment, both prehospital and in-hospital, appears disorganized. The history is often obtained after physical examination and treatment may need to be initiated before the assessment is completed. What seems disorganized should, however, be very systematic. The speed with which emergencies must be handled makes systematic assessment and care very important. Certain key questions organize the approach to emergency assessment and treatment

1. *What is the life-threat to this patient?*

The purpose of this primary survey is to detect life-threatening problems. Treatment of life-threats, both medical and traumatic, must be started before further assessment.

2. *What is the most serious condition that this patient could have?*

Diagnosis of a patient in the field is often not possible. However, appropriate care should be possible in most instances. It is important to treat the patient as if he or she has whatever would be most dangerous to that patient. When the patient is considered serious until proven otherwise, the prehospital care workers are prepared for anything.

3. *What has caused the patient or family to seek help at this time?*

Particularly with medical problems, the real purpose of the call must be determined. What is new about the patient's problem? What has changed recently to make the patient or family consider this an emergency at this time?

4. *What data can be gathered from the scene that will help improve patient care?*

The EMT or Paramedic is the physician's eyes in the field. He or she is the only health-care provider who can observe the patient's environment, the mechanism of injury, empty pill bottles or syringes, and the patient's ability to care for himself. The data obtained in the field can be invaluable to patient care and outcome.

5. *How can field care keep this patient from becoming worse?*

By field stabilization, an attempt is made to prevent or minimize patient deterioration during prehospital care. Management to prevent deterioration is always a part of care, even if further treatment cannot be performed or is not indicated. Stabilization can provide relatively definitive treatment for some patients, as with splinting a fractured extremity. On the other hand, when no field techniques can keep the patient from deteriorating, treatment may consist of rapid transport to minimize time in the field.

6. *Does this patient require treatment before reaching the hospital?*

The BLS service must be aware of the transport time, the risk of delaying treatment, and the illnesses that are best managed by a call for ALS back-up or rendezvous during transport to the hospital. The ALS service must be aware of risks of treatment, expected benefits, and stability of the patient with no treatment.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 23 of 304</p>
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7. *What treatment is appropriate for this patient?*

Some problems can be adequately documented and definitively treated in the field (e.g., ventricular fibrillation, hypoglycemia). Some can't be diagnosed or managed in the field. Many problems lie between these two extremes. Deciding who to treat and how requires judgment

1. How certain is the diagnosis?
2. How sick is the patient?
3. Can the problem be identified before treatment?
4. How effective is the treatment?
5. What are the hazards of the proposed treatment?
6. What are the risks of delaying treatment?
7. How much will the treatment alter the ability of the physician to assess the patient at the hospital?
8. What is the transport time?

The ability to use good judgment in assessing the patient is a more difficult and yet more valuable skill than any of the technical skills involved in prehospital treatment.

8. *Has medical authority been consulted appropriately?*

Frequently, it is necessary to make rapid assessments and treatment decisions with little time to gather information. There will always be some situations which are unclear, abnormal or complicated for many reasons. The radio is an essential tool for assessment too. Use it to share the picture with the physician or nurse. It can often lead to better understanding of the patient's illness.

9. *Have the treatment decisions taken into consideration the surroundings and the patient's situation?*

Care must be individualized. IS THIS PATIENT CAPABLE OF TAKING CARE OF HIMSELF if he is unwilling to be transported? Is the patient competent to refuse or consent to treatment? Will the patient be safe if left at home or at the scene?

Patient evaluation, then, requires not just competent history-taking, or even the competent physical examination, but an evaluation of multiple factors which vary from patient to patient. Stabilization and treatment must be started without complete knowledge of what this patient's disease process may be. In addition to changes in the patient's condition, more complete information often becomes available after the initial assessment and initiation of treatment (from witnesses, newly arrived friends or relatives and other sources) requiring regular review of data and appropriate adjustments in treatment. This constantly changing set of data both limits the ability to treat in the field and provides a challenge to work skillfully to make the most of field assessment with the limited tools available.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 24 of 304
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## **INITIAL PATIENT ASSESSMENT – (MEDICAL AND TRAUMA PATIENT)**

### **Environmental Assessment**

- A. Recognize environmental hazards to rescuers, and secure area for treatment. Utilize standard infectious disease precautions.
- B. Recognize continuing hazard for patient, and protect them from further injury.
- C. Identify number of patients. Initiate a triage system if appropriate.
- D. Observe position of patient, mechanism of injury, or nature of illness.
- E. Identify self.
- F. Initiate communications if hospital resources require mobilization. Call for backup if needed.

### **Initial Assessment**

#### *Airway, Breathing, Circulation (ABCs)*

- A. General Impression
- B. Assess level of consciousness
- C. Airway
  1. Observe the mouth and upper airway for air movement.
  2. Open airway if needed – use head-tilt/chin-lift in medical patients, chin-lift (without head-tilt) or jaw-thrust in trauma victims.
  3. Protect cervical spine from movement in trauma victims. Use assistant to provide continuous manual stabilization (NOT traction).
  4. Look for evidence of upper airway problems such as vomitus, bleeding, or facial trauma.
  5. Clear upper airway of mechanical obstruction with finger sweep or suction as needed.
- D. Breathing
  1. Expose chest and observe chest wall movement.
  2. Note respiratory rate (qualitative), noise, and effort.
  3. Treat respiratory arrest with
    - a. Pocket mask or bag-valve-mask (BVM) for initial ventilatory control. Check pulse, begin CPR if none.
    - b. Intubate after initial ventilations if necessary. Check tube placement.
  4. Assess for partial or complete obstruction. Treat according to protocol.
  5. If respiratory rate < 12/minute or breathing appears inadequate
    - a. Assist respirations with pocket mask or BVM. Apply O<sub>2</sub>.
    - b. Consider tracheal intubation to secure airway if necessary. Check tube placement.
  6. Observe skin color, mentation for signs of hypoxia. Apply O<sub>2</sub>, high flow (10-15 L/min), by mask if signs of severe hypoxia.
  7. Look for life-threatening respiratory problems and stabilize (see Chest Trauma)
    - a. Open or sucking chest wound – seal.
    - b. Large flail segment – stabilize.
    - c. Tension pneumothorax – transport rapidly and consider decompression.

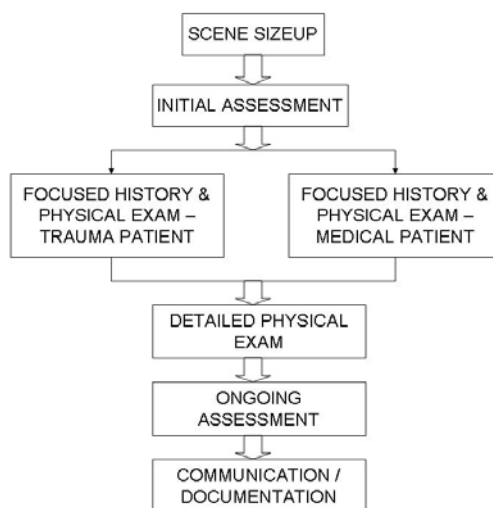
<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 25 of 304
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- E. Circulation
  1. Control hemorrhage by direct pressure with clean dressing to wound. If needed, use tourniquet.
  2. Palpate for radial pulse – presence implies BP > 80 systolic. If not present, check carotid or femoral pulse (presence implies BP > 60-70). If no pulses present, begin CPR.
  3. Note pulse quality (strong, weak), and general rate (slow, fast, moderate).
  4. If evidence of medical shock or severe hypovolemia, obtain baseline vital signs immediately and begin treatment according to protocols.
- F. Establish Patient Priorities
  1. Determine if immediate transport indicated or
  2. Determine priorities for scene treatment prior to transport.

**Special Notes**

- A. Initial assessment may take 30 seconds or less in a medical patient or victim of minor trauma. In the severely traumatized patient, however, assessment and treatment of life-threatening injuries evaluated in the initial assessment may require additional time for rapid intervention, with treatment and further assessment enroute to the hospital.
- B. In the awake patient, the initial assessment may be completed by your initial greeting to the patient. This may make it clear that the ABCs are stable and emergency intervention is not required before completing assessment.
- C. Neck should be immobilized and secured during airway assessment or immediately following initial assessment if indicated.
- D. Specific vital signs (blood pressure, pulse, respiratory rate, Glasgow Coma Score) should be obtained after the initial assessment. If immediate intervention for hypoventilation or profound shock is required, this may need to be initiated before numerical vital signs are obtained.

**PATIENT ASSESSMENT**



<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 26 of 304
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### **DETAILED PHYSICAL EXAM – (TRAUMA PATIENT ASSESSMENT)**

Detailed Physical Exam is the systematic assessment of the entire patient. It should be performed after

1. Initial Patient Assessment.
2. Stabilization and initial treatment of life-threatening airway, breathing, or circulatory difficulties.
3. Cervical immobilization as needed.
4. Initial vital signs (may be done simultaneously by associate).

The purpose of the Detailed Physical Exam is to uncover problems which are not life-threatening but which could be injurious or could become life-threatening to the patient.

**A. Head and Face**

1. Observe for deformities, asymmetry, bleeding.
2. Palpate for deformities, tenderness, and crepitus.
3. Recheck airway for potential obstruction – Dentures, bleeding, loose or avulsed teeth, vomitus, and abnormal tooth position from mandibular fracture, absent gag reflex.
4. Eyes – pupils (equal or unequal, shape, responsiveness to light), search for foreign bodies, or contact lenses.
5. Nose – deformity, bleeding, discharge.
6. Ears – bleeding, discharge, bruising behind ears.

**B. Neck**

1. Recheck manually for deformity, abrasions or tenderness if not already immobilized.
2. Observe for wounds, trauma, and neck vein distention, use of neck muscles for respiration, altered voice, and medical alert tags.
3. Palpate for crepitus, tracheal shift.

**C. Chest**

1. Observe for wounds, symmetry of chest wall movement.
2. Palpate for tenderness, wounds, fractures, crepitus, and unequal rise of chest.
3. Have patient take deep breath. Observe for pain, symmetry, air leak from wounds.
4. Auscultate for abnormal breath sounds.

**D. Abdomen**

1. Observe for obvious wounds, bruising, distention
2. Palpate all four quadrants for tenderness, rigidity, and masses.

**E. Pelvis**

1. Palpate and compress lateral pelvic rims and symphysis pubis for tenderness or instability.

**F. Shoulders/Upper Extremities**

1. Observe for angulation, protruding bone ends, symmetry.
2. Palpate for tenderness, crepitus.
3. Note distal pulses, color, medical alert tags.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 27 of 304
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4. Check sensation.
  5. Test for weakness if no obvious fracture, pain, or deformity present (have patient squeeze your hands).
  6. If no obvious fracture, pain, or deformity gently move arms to check overall function and range of motion.
- G. Lower Extremities
1. Observe for angulation, protruding bone ends, symmetry.
  2. Palpate for tenderness, crepitus.
  3. Note distal pulses, color.
  4. Check sensation.
  5. Test for weakness if no obvious fracture, pain, or deformity present (have patient push/pull feet against your hands).
  6. If no obvious fracture, pain, or deformity gently move legs to check overall function and range of motion.
- H. Back
1. Log roll, observe and palpate for wounds, fractures, tenderness, bruising.
  2. Recheck motor and sensory function as appropriate.

### **Special Notes**

- A. Detailed physical exam should take 1-2 minutes to complete.
- B. Be systematic. If you jump from one obvious injury to another, the subtle injury that is most dangerous to the patient may be easily missed.
- C. Interruption of the detailed physical exam should only occur if the patient experiences airway, breathing or circulatory deterioration. Otherwise complete the exam before beginning to address the secondary problems that have been identified.
- D. Obtain and record two or more sets of vital signs and neurologic observations prior to transport or enroute.
- E. Orthostatic vital signs are of questionable value. Physiologic variability is great, and a barely compensated patient with hypovolemia can be made critical by the stress of upright or even sitting position.
- F. The concept of "stable" probably has no place in the field evaluation of the trauma patient. Patients with apparently "normal" vital signs in the field can "CRASH" in the emergency department - not due to inadequate evaluation - but because their normal body compensatory mechanisms become overwhelmed. Occult hemorrhage is difficult to detect without specialized studies. It may first be suspected when the patient develops signs of shock. At that point the blood loss may be close to lethal. (The only truly "stable" trauma patient is the one you cared for yesterday and who is now under observation and doing well.)

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 28 of 304</p>
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### **DETAILED PHYSICAL EXAM – (MEDICAL PATIENT ASSESSMENT)**

An initial assessment is done on all medical and trauma patients. In awake medical patients, this may consist only of identifying yourself and noting the patient's responsiveness and general appearance. A full head-to-toe detailed physical exam may not need to be done on patients with a specific complaint, such as "chest pain." Assessment must be no less thorough, but it may be limited to the body systems that are pertinent to the presenting problem.

- A. **Vital signs** – Quantitative vital signs usually precede the rest of the exam.
  
- B. **Head/Face**
  - 1. Note airway patency, oral swelling, and hydration.
  - 2. Eyes – note pupil symmetry, reaction to light, movement.
  - 3. Note symmetry of facial movements.
  
- C. **Neck**
  - 1. Observe for neck vein distention in the upright position, use of accessory muscles for breathing.
  - 2. Auscultate
  
- D. **Chest**
  - 1. Observe chest wall for symmetry of air movement and evidence of respiratory effort.
  - 2. Auscultate
    - a. Breath sounds for symmetry, rales, wheezing, or evidence of obstruction.
    - b. Heart for regularity (if irregular, is it intermittently or consistently irregular?)
  
- E. **Abdomen**
  - 1. Observe for distention, bruising.
  - 2. Palpate (gently) for tenderness, rigidity, masses.
  
- F. **Extremities**
  - 1. Observe – presence of edema, color of skin.
  - 2. Palpate for warmth, tenderness, presence of pulses, capillary refill.
  
- G. **Neurologic exam** – See Neurologic Assessment.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 29 of 304
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## PATIENT HISTORY – (MEDICAL AND TRAUMA PATIENT)

### Medical

- A. **Chief complaint**
  - 1. When did it start? How long has it been going on? Is it changing?
  - 2. How intense is the problem? Very severe, mild?
  - 3. What caused or brought on the condition?
  - 4. Does anything make it better or worse?
  - 5. For pain – describe the location, type of pain, severity (1-10 scale), and radiation.
  - 6. What caused the patient or family to seek help at this time?
  - 7. Has the patient experienced or been treated before for this problem? When? What was the usual treatment?
  - 8. Are any other symptoms bothering the patient at this time?
- B. **Associated complaints** – Question as for chief complaint.
- C. Relevant past **medical history**.
- D. **Allergies**.
- E. **Medications and drugs** – Chronic and "on-board."
- F. **Survey of surroundings** for evidence of drug abuse, mental functioning, family problems.

### Trauma

- A. **Chief complaints** – Areas of tenderness, pain.
- B. **Associated complaints** – Trouble breathing, dizziness.
- C. **Mechanism of injury**
  - 1. What were the implements involved – weapons, autos, machinery?
  - 2. How did the injury happen – cause, precipitating factors?
  - 3. What trajectories were involved – bullets, cars, people?
  - 4. How forceful was the mechanism – speed of cars, force of blow, and height of fall?
  - 5. With a vehicle – What is the condition of windshield, steering wheel, passenger compartment intrusion, seatbelt/airbag use?
- D. Mental status and pertinent findings since accident according to witnesses or bystanders.
- E. Treatment prior to EMS arrival – Movement of patient by bystanders, etc.

### Special Notes

- A. Do not let information gathering distract from the management of life-threatening problems.
- B. Appropriate questioning can provide valuable information while establishing authority, competence, and rapport with patient.
- C. Two types of information are used to assess medical or trauma conditions. Subjective information is related by the patient in taking a history, and describes SYMPTOMS. The physical exam provides SIGNS, or objective information, which may or may not correlate with the patient's symptoms.
- D. In medical situations, history is commonly obtained before or during physical assessment.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 30 of 304
---	-----------------------	-------------------------------

- E. In trauma cases it may be simultaneous or following the initial patient assessment. An assistant is often used for gathering information from patient or bystanders.
- F. Carefully examine all areas where the patient complains of pain, but realize that the patient's capacity to feel pain is usually limited to one or two areas – even if more are injured! Patients under the influence of drugs or alcohol may not feel pain in spite of significant injuries. That is why a systematic survey is important even in an awake patient.
- G. USE BYSTANDERS to confirm information obtained from the patient and to provide facts when the patient cannot. History from the scene is invaluable.
- H. Over-the-counter medications (including aspirin and "cold or home remedies") are frequently overlooked by patient and rescuer, but may be important to emergency problems.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 31 of 304
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### **PEDIATRIC PATIENT ASSESSMENT**

Children can be examined easily from one end to the other, but lack of understanding by the patient, poor cooperation, and fright often limit the ability to assess completely in the field. The "Head-to-Toe" approach in children probably needs to be a "Toe-to-Head" approach. The exam needs to be systematic, but if the initial assessment does not reveal immediate life threats, the child will be less threatened by a more distant approach to begin the exam. Observations about spontaneous movements of the patient and areas that the child protects are very important.

A. Initial Assessment

1. Airway, Breathing, and Circulation.
2. Evaluate and secure.

B. General

1. Level of alertness, eye contact, attention to surroundings.
2. Muscle tone – normal, increased, or weak and flaccid.
3. Observe responsiveness to parents, caregivers. Is the patient playful or irritable?

C. Extremities

1. Brachial pulse.
2. Signs of trauma.
3. Muscle tone, symmetry of movement.
4. Skin temperature and color, capillary refill.
5. Areas of tenderness, guarding or limited movement.

D. Abdomen – Observe child for bruises, abrasions, distention, rigidity, or tenderness.

E. Chest

1. Note presence of stridor, retractions (depressions between ribs on inspiration) or increased respiratory effort, respiratory rate.
2. Breath sounds – symmetrical, rales, wheezes?
3. Heart – rate, obvious murmur.

F. Neck – Note stiffness. Auscultate for obstruction, wheezing, or stridor.

G. Head

1. Signs of trauma.
2. Fontanelle, if open – abnormal depression or bulging.

H. Face

1. Pupils – size, shape, symmetry, reaction to light.
2. Hydration – brightness of eyes. Is the child making tears? Is the mouth moist?

I. Neurologic Assessment

**TABLE 1.1 NORMAL VITAL SIGNS IN THE PEDIATRIC AGE GROUP**

Age	Pulse Beats/min	Respirations Rate/min	Blood Pressure Systolic +/- 20
Premature	144	20-38	N/A
Newborn	140	20-38	N/A
6 month	130	20-30	80 palp
1 year	125	20-24	90 palp
3 years	110	20-24	95 palp
5 years	100	20-24	95 palp
8-10 years	90	12-20	100 palp

### NEUROLOGIC ASSESSMENT

Management of patients with head injury or neurologic illness depends on careful assessment of neurologic function. Changes are particularly important. The first observations of neurologic status in the field provide the basis for monitoring sequential changes. It is therefore important that the first responder accurately observe and record neurologic assessment, using measures which will be followed throughout the patient's hospital course.

- A. Vital Signs – Observe particularly for adequacy of ventilations, depth, frequency, and regularity of respirations.
- B. Level of consciousness

**TABLE 1.2 Glasgow Coma Score**

	Adult	Revised Pediatric	
Eye Opening	None	None	1
	To pain	To pain	2
	To Speech	To Speech	3
	Spontaneously	Spontaneously	4
Best Verbal Response	None	None	1
	Garbled sounds	Inconsolable, agitated	2
	Inappropriate words	Inconsistently inconsolable, moaning	3
	Disoriented sentences	Cries but consolable, inappropriate interactions	4
	Oriented	Smiles, orientated to sounds, follows objects, interacts	5
Best motor response	None	None	1
	Abnormal extension	Decerebrate Posturing	2
	Abnormal flexion	Decorticate Posturing	3
	Withdrawal to pain	Withdrawal to pain	4
	Localizes pain	Withdraws from touch	5
	Obeys commands	Moves spontaneously or purposefully	6

GLASGOW COMA SCORE = Sum of scores in 3 categories(15 points possible)

- C. Eyes
  - 1. Direction of gaze.
  - 2. Tracking of gaze.
  - 3. Size and reactivity of pupils.
- D. Movement – Observe whether all four extremities move equally well, have equal strength.
- E. Sensation (if patient awake) – Observe for absent, abnormal or normal sensation at different levels if cord injury is suspected.

**Special Notes**

- A. The Glasgow Coma Scale (GCS) is one method of scoring and monitoring patients with head injury. It is readily learned, has little observer-to-observer variability, and reflects cerebral function. Always record specific responses rather than just the score (sum of observations). The other parameters listed must be observed to fully assess the impaired patient. If stroke is suspected, use the Cincinnati Stroke Scale (Table 1.3)
- B. Use a flow sheet to follow and identify changes.
- C. Sensory and motor exam must be documented before moving patient with suspected spinal injury.
- D. Sensory deficit levels should be marked gently on the patient's skin with a pen to help identify any changes.
- E. Note what stimulus is being used when recording responses. Applied noxious stimuli must be adequate to the task but not excessive. Initial mild stimuli can include light pinch, dull pinprick, or light sternal rub. If these are unsuccessful at eliciting a pain response stronger pinch (particularly in axilla), or sternal rub will be necessary to demonstrate the patient's best motor response.
- F. When responses are not symmetrical, use motor response of the best side for scoring GCS and note asymmetry as part of neurologic evaluation.
- G. Use of restraints or intubation of patient will make some observations less accurate. Note on chart if circumstances do not permit full verbal or motor evaluation.
- H. In small children, the GCS may be difficult or impossible to evaluate. Children who are alert and appropriate should focus their eyes and follow your actions, respond to parents or caregivers, and use language and behavior appropriate to their age level. In addition, they should have normal muscle tone and a normal cry.
- I. Drug ingestion, hypotension, and alcohol intoxication can all depress the GCS. Since the effects of drugs or alcohol cannot be assessed in the field, the score may be depressed for reasons other than head injury. The GCS cannot, therefore, be used for prognostication. Its main contribution is to monitor deterioration or improvement of the patient.

**TABLE 1.3 Cincinnati Stroke Scale**

	<b>Normal</b>	<b>Abnormal</b>
Facial Droop	Both sides of face move equally	One side of face does not move at all
Arm Drift	Both arms move equally or not at all	One arm drifts compared to the other
Speech	Patient uses correct words with no slurring	Slurred or inappropriate words or mute

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 35 of 304</p>
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## **TRIAGE: MULTIPLE PATIENT ASSESSMENT**

### **Definition**

Triage, from the French – to sort, sift or pick out, specifically, the sorting of and allocation of treatment to patients

### **Indications**

Emergencies (usually traumatic) involving more than one patient, interaction between different agencies, and the need to make choices regarding treatment

### **Priorities**

- A. Park vehicle in safe position that best protects emergency workers and the patients
- B. First arriving crew will perform an initial scene size-up. Establish Incident Command. Proceed only when safe to rescuer.
- C. Begin a “primary” triage to rapidly establish the number of victims and the severity of the injuries. Stop only to perform immediate life saving interventions, including: Opening or repositioning the airway, inserting an oropharyngeal airway, and/or placing the victim in the recovery position
  1. Control severe hemorrhage with a pressure dressing or tourniquet
  2. For pediatric patients with pulses, but not breathing, provide 5 rescue breaths to stimulate spontaneous breathing
  3. All other treatment should be done in the treatment area or enroute to the hospital
- D. Establish communications and request necessary assistance. Provide initial estimate of number and types of injuries. Notify hospitals through the EMS system.
- E. The Incident Commander will designate, or ensure designation of
  1. Triage Leader – Responsible for appointing triage teams to perform the initial or “primary” triage of all patients
    - a. Categorize and tag all patients
    - b. Coordinate litter teams to move patients to treatment areas or the transportation area
  2. Treatment officer – responsible for appointing treatment area managers and adequate staffing for each area to treat patients until transportation is available.
    - a. Select treatment areas that are safe, large enough to handle the number of patients, close, and provides access to the transportation loading area
    - b. Ensure “secondary” triage is done as patients are delivered to the treatment area
    - c. Manage the treatment and packaging of all patients, with emphasis on rapid transportation
    - d. Treatment areas shall be arranged in groupings using colored tarps, cones, or flags
    - e. Ensure that triage tags are placed on all patients prior to moving them to the transportation area
  3. Transportation Leader/Supervisor: responsible for managing all modes of patient transportation, including patient and destination tracking
    - a. Determine and request all appropriate modes of transportation such as ground and air ambulances, mass transit, school busses, and transport vans

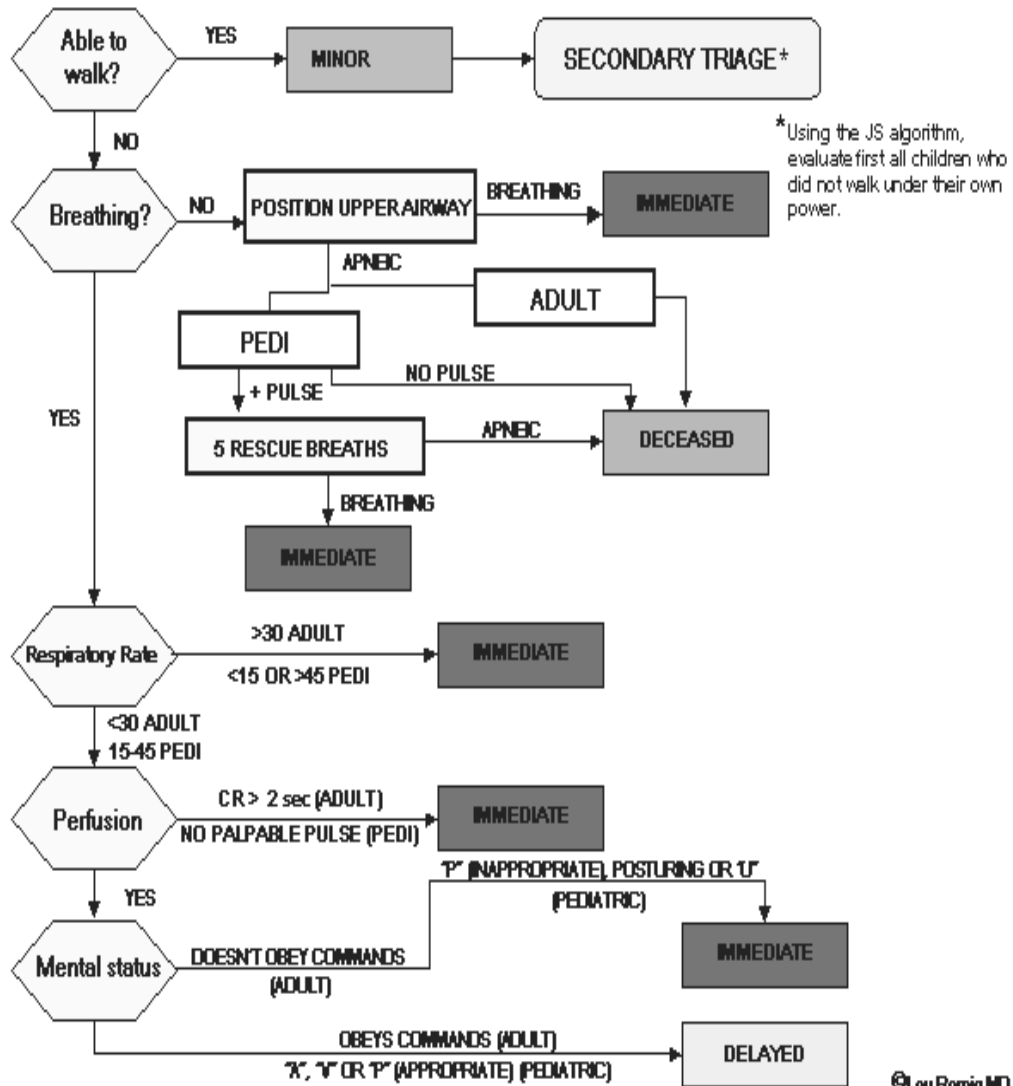
<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 36 of 304</p>
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- b. Determine transport loading areas, access points, and egress routes
  - c. Coordinate air ambulance operations including establishing landing zones and radio communication talk groups
  - d. Determine hospital availability through dispatch, the Colorado EMS system, or if needed, direct contact with area hospital
  - e. Remove and collect tracking slips from triage tags, and maintain a tracking record of all patients transported and their destination
  - f. Report up the chain of command when all patients have been transported from the scene
  - g. The transportation function may initially be established as a Transportation Unit, and upgraded to a Transportation Group based on the incident size and complexity
- F. Communication – is a key element that must be established early to make the incident operate effectively
- 1. Command shall assign additional talk groups (radio channels) with consideration of sections, branches, groups, divisions, and units
  - 2. For incidents within the Colorado Springs city limits, emergency responders' radio communication should take place on A-Zone talk groups
  - 3. For incidents within El Paso County, radio communications should take place on the C-Zone talk groups
  - 4. For incidents at the Colorado Springs Airport, radio communications should take place on C-8.
  - 5. For incidents involving regional, state, or federal agencies, radio communications should take place on the E-Zone talk groups.
  - 6. Alternate communication methods during MCIs can be more effective and can include
    - a. Face-to-face communication, when possible, for non-critical information
    - b. Mobile phones, but can become overloaded and should not be relied on as a primary means of communication
    - c. Computers and fax machines may be used as a secondary means of sharing information, but have limited field use, and may not be reliable during natural disasters

### **Special Notes**

- A. Multiple-patient scenes will always be a challenge to prehospital planning and ingenuity. Disaster drills and response plans prepare emergency responders to better respond to actual disasters
- B. The Incident Command structure under the National Incident Management System (NIMS) is mandated by Presidential Directive, to be used by local, regional, state, and federal response agencies, to mitigate emergency incidents
- C. Multiple-trauma patients with no pulses and no respirations on arrival of emergency responders have a very poor chance of survival. If there are other victims with signs of life, attention will be better directed at trying to save them

## Combined START/JumpSTART Triage Algorithm



<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 38 of 304</p>
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## **DEATH IN THE FIELD**

### **Indications**

- A. Pronouncement of death in the field (without initiation of resuscitation) should include the following instances

**Patient unresponsive, apneic, pulseless, AND**

1. Decapitation, or
2. Decomposition, or
3. Rigor mortis with warm air temperature, or
4. Multiple casualty situation where system resources are required for stabilization of living patients, or
5. Advanced Directive which specifies DO NOT RESUSCITATE.

- B. Certain other circumstances may require exception and personnel should receive permission from base physician (with BLS in progress) at the time of the occurrence

**Patient unresponsive, apneic, pulseless, AND**

1. Advanced age, showing extreme wasting of severe chronic disease, or
2. Pre-arranged written "no resuscitation" order for terminal patient by patient's physician, or
3. A verbal "no resuscitation" order from an attending physician who is present at the time. This physician should be able to identify him/her self and provide information about the patient consistent with an ongoing relationship. A physician who "drops by" to help and has no knowledge of the patient is NOT considered an attending physician, or
4. A verbal "no resuscitation" order from an attending physician via radio or phone. If at all possible these physicians should be requested to contact the emergency physician at the base or receiving hospital to clarify the course of action.

- C. Indications for terminating resuscitative efforts [Colorado Department of Public Health and Environment, Emergency Medical and Trauma Services Section, Resuscitation Guidelines].

Resuscitative efforts may be terminated in patients found **apneic and pulseless** with

1. Blunt trauma to the head, neck or torso and
  - a. No spontaneous pulse or respirations following appropriate medical interventions, which may include – opening the airway, bag-valve-mask ventilation, intubation, or release of tension pneumothorax.

(The majority of injuries sustained by these patients are not compatible with life. "Appropriate" interventions will vary and should be dictated by individual standing orders and direct medical control.)

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 39 of 304</p>
---	-------------------------------	--

2. Penetrating trauma and
  - a. No spontaneous pulse or respirations following appropriate medical interventions, which may include – opening the airway, bag-valve-mask ventilation, intubation, or release of tension pneumothorax; or
  - b. Provision of ALS (intermediate or paramedic EMS services or hospital emergency department) is unavailable for 20 minutes from the time EMS personnel initiate on-scene assessment.  
(Some of the injuries sustained by these patients may be compatible with life. "Appropriate" interventions will vary and should be dictated by individual standing orders and direct medical control.)
  
3. No evidence of trauma (presumed medical arrest) and
  - a. No return of spontaneous pulse or respiration during thirty (30) minutes of CPR; or
  - b. Patient remains in asystole for at least ten minutes (30 minutes for pediatric patients) after successful intubation and medications and no reversible causes are identified.

**Precautions**

- A. Death cannot be judged in the hypothermic patient who may be asystolic, apneic, and stiff but may still survive intact. Transport for rewarming in all instances.
- B. Those who fall under the guidelines in **Indications - A**. (decapitation, decomposition, etc.) should be left at the scene with law enforcement personnel.
- C. Even with "Do Not Resuscitate" orders, if there seems to be any disagreement among the family, it is better to err on the side of PROVIDING life support. This is not true of patients with clear Colorado Advanced Directives directing NO CPR be performed. THE PATIENT'S WISHES MUST BE HONORED IF A COLORADO ADVANCED DIRECTIVE IS APPARENT AND IMMEDIATELY AVAILABLE.

**Special Notes**

- A. Rescue personnel, like emergency department personnel, must have the ability to discuss their own grief over problem cases with each other and their advisers. Moreover, they must come to terms with their mission, what can be accomplished in the field (not every life can be saved), and the importance of having resolved ethical issues before taking care of individual problems.
- B. If the situation appears to be a potential crime scene, EMS providers should disturb the scene as little as possible.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 40 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	<b>Document # 04-2010</b>	<b>Rev.: Page #: 41 of 304</b>
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**CHAPTER 2**

**MEDICAL TREATMENT PROTOCOLS**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 42 of 304
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<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 43 of 304</p>
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## **INTRODUCTION TO TREATMENT PROTOCOLS**

The following five chapters contain recommended treatment protocols for common presenting prehospital problems. The problems are divided into the following categories

Chapter 2	Medical
Chapter 3	Pediatric Medical
Chapter 4	Trauma
Chapter 5	Environmental
Chapter 6	Hazardous Materials

Within each chapter, the problems are organized in alphabetical order.

We have attempted to present the problems wherever possible by the presenting symptoms or findings, rather than by the diagnosis. Patients rarely present with a known diagnosis, and often field diagnosis is neither necessary nor desirable. The decisions about when and how to treat must be based on data available to the EMT or Paramedic at the scene. We have tried to apply this principle whenever possible.

- Assessment of patients to the practitioner's level of training is presumed, and therefore, not reiterated within each protocol
- The performance of common care procedures (in accordance with the practitioner's scope of practice), such as the administration of oxygen, suctioning, initiating an intravenous line, applying a cardiac monitor, determining blood glucose levels, and monitoring vital signs, are presumed. Therefore, they are not reiterated throughout these protocols
- All care, in regard to the administration of medications, assessment, and performance of procedures, shall be provided in accordance with the practitioner's scope of practice, defined by the most recent version of the Colorado Board of Medical Examiners Rule 500. As such, specific care guidelines will not be delineated within these protocols, except to denote restrictions on the scope of practice. If allowed by Rule 500, we will expect the practitioners to follow appropriate guidelines.
- Medications and procedures are to be administered in accordance with the manufacturer guidelines, unless otherwise noted within these protocols

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 44 of 304
---	-----------------------	-------------------------------

## ABDOMINAL PAIN

### Specific information needed

- A. Pain – nature (sharp, dull, crampy, constant or intermittent), duration, location; radiation to back, groin, chest, shoulder.
- B. Associated symptoms – nausea, vomiting (bloody or coffee-ground), diarrhea, constipation, black or tarry stools, urinary difficulties, menstrual history, and fever.
- C. Past history – previous trauma, abnormal ingestion, medications, known diseases, surgery.

### Specific objective findings

- A. Vital signs.
- B. General appearance – restless, quiet, sweaty, pale.
- C. Abdomen – tenderness, guarding, and bowel sounds, distention, pulsatile mass.
- D. Emesis – appearance, amount.

### Treatment

- A. Position of comfort.
- B. Give nothing by mouth (NPO).
- C. O<sub>2</sub>, moderate flow (4-6 L/min). Titrate to pulse oximetry > 90%.
- D. If BP < 90 systolic and signs of hypovolemic shock
  - 1. Increase O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90%, if possible.
  - 2. IV – volume expander (NS or RL), large bore, TKO or as directed.
- E. IV, volume expander (NS or RL), TKO if vital signs normal but pain severe and transport time > 15 minutes.
- F. Monitor vital signs during transport.

### Specific precautions

- A. Causes of abdominal pain can rarely be determined in the field. Pain medication is occasionally indicated. Small doses will seldom change details of the physical exam.
- B. The most important diagnoses to consider are those associated with catastrophic internal bleeding: ruptured aneurysm, liver, spleen, ectopic pregnancy, etc. Since the bleeding is not apparent, you must think of the volume depletion and monitor patient closely to recognize shock.
- C. Elderly patients may have significant hypovolemic shock with systolic blood pressures above 90 mm Hg. With signs of hypovolemia (see medical shock) contact base and treat with fluids
- D. Upper abdominal and lower chest pain may be due to intrathoracic problems such as MI, dissecting aneurysm, etc. Large fluid boluses may be contraindicated. Contact base for discussion.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 45 of 304
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## ALLERGY/ANAPHYLAXIS

### Specific information needed

- A. History – exposure to allergens (bee stings, drugs, nuts, seafood most common), prior allergic reactions.
- B. Current Symptoms – itching, wheezing, respiratory distress, nausea, weakness, urticaria.
- C. Medications.

### Specific objective findings

- A. Vital signs, level of consciousness.
- B. Respiration – wheezing, upper airway noise, effort.
- C. Mouth – tongue or upper airway swelling.
- D. Skin – hives, swelling, flushing.

### Treatment

- A. Ensure airway, suction as needed.  
Early intubation may be advisable before swelling becomes severe.
- B. Position of comfort (upright if respiratory distress predominates, supine if shock prominent).
- C. O<sub>2</sub>, high flow (10-15 L/min), by reservoir mask if respiratory distress severe. Titrate to pulse oximetry > 90% if possible.
- D. Remove injection mechanism if still present (stinger, needle, etc.).
- E. If signs of severe generalized reaction are present
  1. IV – volume expander (NS or RL), large bore, TKO.
  2. Consider Epinephrine 1:1,000, 0.3 ml SQ, IM, Albuterol neb or Epinephrine Auto Injector.
  3. Diphenhydramine 50 mg IV.
- F. If BP < 90 systolic and signs of shock (Anaphylaxis)
  1. Fluid bolus – 20 ml/kg, volume expander (NS or RL) IV.
  2. Epinephrine 1:10,000, 1 ml slow IV in adult. May repeat epinephrine dose once after 5 minutes if needed.
  3. Diphenhydramine 50 mg IV.
  4. Dexamethasone 10 mg IV
- G. For respiratory distress
  1. Albuterol 2.5 mg/3 ml by nebulization. May need to repeat or give constant nebulizations with severe wheezing.
  2. Epinephrine, 1:1,000, 0.3 ml SQ or IM in adult (0.01 ml/kg SQ in child)  
Use SQ dose if patient BP > 90 systolic. (Use IV dose as above if patient hypotensive.)
  3. Diphenhydramine 50 mg IV if needed.
  4. Dexamethasone
    - a. > 10 years old: 10 mg IV
    - b. < 10 years old: 0.6 mg/kg IV.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 46 of 304
---	-----------------------	-------------------------------

- H. Monitor cardiac rhythm in all patients who require treatment.
- I. Transport rapidly if patient unstable. Call for back-up if needed.
- J. Prepare to assist ventilations if respiratory arrest occurs.

**Specific precautions**

- A. Allergic reactions can take multiple forms. Early consultation with base physician is encouraged.
- B. Anxiety, tremor, palpitations, tachycardia, and headache are not uncommon with administration of epinephrine. These may be particularly severe when epinephrine is given IV. In children, epinephrine may induce vomiting. In elderly patients, angina, MI or dysrhythmias may be precipitated.
- C. Two forms of epinephrine are carried as part of paramedic equipment. The standard ampules of aqueous epinephrine contain a 1:1,000 dilution appropriate for SQ or IM injection. IV epinephrine should be given in a 1:10,000 dilution. Use the "cardiac" epinephrine (1:10,000) which is premixed for IV dosing to avoid mistakes. BE SURE YOU ARE GIVING THE PROPER DILUTION TO YOUR PATIENT.
- D. Before treating anaphylaxis, be sure your patient has objective signs as well as subjective symptoms. Patients who are hyperventilating will occasionally think they are having an allergic reaction. Epinephrine will just aggravate their anxiety.
- E. Lethal edema may be localized to the tongue, uvula, or other parts of the upper airway and restrict air flow. Examine closely, and be prepared for early intubation before swelling compromises airway.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 47 of 304
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## **ALTERED MENTAL STATES/BEHAVIORAL PROBLEMS**

### **Specific information needed**

- A. History – recent crisis, physical or emotional trauma, bizarre or abrupt changes in behavior, suicidal ideation, alcohol/drug intoxication, toxic exposure, exertion or heat exposure.
- B. Past history – previous psychiatric disorders, medical problems (seizures, diabetes) or medications (including insulin, anti-depressants, other mood-altering drugs).

### **Specific objective findings**

- A. Vital signs (note pupil size, symmetry, reactivity).
- B. Mental status – see Neurologic Assessment.
- C. Characteristic odor to breath.
- D. Medical alert tags.
- E. Outside air temperature; patient's temperature.

### **Treatment**

- A. Ensure airway, breathing, and circulation.
- B. Remove or have police remove dangerous objects (e.g., weapons, drugs).
- C. Consider hyperthermia or hypothermia, and treat according to protocols.
- D. Restrain if necessary (lateral recumbent position preferred).
- E. Consider administration of haloperidol 5 mg IM if patient is so violently combative that restraint or provision of medical care endangers personnel or patient. If patient violent and IV established, administer diazepam 5 mg IV. Consider 25-50 mg diphenhydramine.
- F. Do not leave patient unattended.
- G. Explain all procedures to the patient and try to establish rapport.
- H. If patient is not alert or vitals unstable
  - 1. Start O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
  - 2. IV – volume expander (NS or RL), large bore, TKO or as directed.
  - 3. Test blood for glucose level.
  - 4. Administer dextrose 50%, 50 ml, IV in secure vein if glucose level < 60 mg/dl and patient unable to take sugar orally.
  - 5. Consider naloxone, 0.4 mg IV for suspected narcotic toxicity.
- I. Transport in calm, quiet manner, monitoring vital signs enroute.

### **Specific precautions**

- A. It is important not to forget the organic causes for altered mental states. Psychiatric disorder must be at the bottom of your list, or you may forget important, treatable conditions.

Hypoxia	Postictal states
Hypoglycemia	Drug exposure/overdose
Head injury	Toxic / inhalant exposure
Hyperthermia	Hypothermia
Shock (hypovolemia, anaphylaxis)	

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 48 of 304
---	-----------------------	-------------------------------

- B. An odor of alcohol is not uncommon in altered mental status patients, and often is not the primary problem. Do not blame the alcohol without looking carefully first for other potential problems.
- C. If the patient is medically stable and emergency treatment is not needed, do not unnecessarily invade the patient's privacy.
- D. Try not to escalate verbal violence to physical violence. Do not shout at or ridicule your patient.
- E. If the situation appears threatening, a show of force involving police may be necessary before an attempt to restrain the patient is made. Consider your own safety and limitations. Use enough back-up to be confident and forthright. The use of haloperidol to assist with potentially or actually violent patients is also not without risk. When used properly, however, it should increase the safety of both patient and health care providers. Remember to allow sufficient time for the IM injection to take effect before attempts to transport a difficult patient. If patient needs to be subdued for the injection – restraint should probably be maintained until transported.
- F. Beware of the combative patient who becomes quiet. Check vital signs and airway promptly, and begin resuscitation if needed. Conversely, some patients may regain consciousness due to resuscitation, and then pull out IVs or ET tubes. Be alert!
- G. Psychiatric patients, particularly the chronic callers, can be difficult to manage with concern. Don't succumb to the temptation to "blow off" new complaints. The acute change in condition may be missed.

## **CARBON MONOXIDE EXPOSURE**

### **Specific information needed**

SpCO measurement is to be performed on any person who may have been exposed to atmospheric Carbon Monoxide (CO) at any level. The formation of carboxyhemoglobin (COHb) is a function of the atmospheric concentration and the time of exposure. The determination of CO poisoning is difficult to impossible using atmospheric CO measurement alone.

### **Specific objective findings**

- A. Altered Mental Status, including errors in judgment, confusion, and irritability
- B. Headache
- C. Fatigue
- D. Nausea
- E. Dizziness
- F. Shortness of breath
- G. Collapse

Patients exhibiting vague, confusing, nondescript, or flu-like symptoms should be assessed for SpCO level. The classic “cherry-red” skin coloration associated with carbon monoxide poisoning is a late sign and is an unreliable indicator.

### **Treatment**

- A. Remove patient from the environment, if trained to do so
- B. Maintain patent airway and administer 100% oxygen via non-rebreather mask
- C. Treat other injuries and illnesses per protocol
- D. If a pulse CO-oximeter is available, place probe on ring finger of non-dominant hand
- E. Suspect CO poisoning if SpCO > 3% in non-smokers and > 8% in smokers.
- F. Treat as indicated for symptom and SpCO level:

<b>Level (%)</b>	<b>Signs and Symptoms</b>	<b>Pre-hospital Treatment</b>
0-4	Minor headache	Observe
5-9	Headache	100% oxygen, reassess after 10 minutes on 100% oxygen
10-19	Dyspnea, headache	100% oxygen, transport
20-29	Headache, nausea, dizziness	100% oxygen, transport
30-39	Severe headache, vomiting, altered LOC	100% oxygen, transport
40-49	Confusion, syncope, tachycardia	100% oxygen, transport
50-59	Seizures, shock, apnea, coma	Airway, 100% oxygen, transport
60-100	Coma, death	Airway, 100% oxygen, transport

### **Specific precautions**

For patients with serious symptoms, with or without high SpCO levels, contact Medical Control for possible routing to a hyperbaric facility.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 50 of 304
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## **CARDIAC ARREST**

### **Specific information needed**

- A. History of arrest – onset, preceding symptoms, bystander CPR, or other treatment; duration of arrest.
- B. Past history – disease, medications.
- C. Surroundings – evidence of drug ingestion, trauma, and other unusual presentations.

### **Specific objective findings**

- A. Absence of consciousness.
- B. Terminal or no respirations.
- C. Absence of pulse.
- D. Signs of trauma, blood loss.
- E. Air temperature, skin temperature.

### **Treatment – per American Heart Association Guidelines unless otherwise noted**

- A. Check surroundings for safety to rescuers.
- B. Transfer to a firm surface.
- C. Initiate CPR.
- D. Call for back-up if needed.
- E. Check rhythm with monitor or quick look paddles. If using an Automated External Defibrillator (AED) follow prompts
- F. Treat according to rhythm – Using current AHA Guidelines.

### **Specific precautions**

- A. Cardiac arrest in a trauma situation is not treated according to this protocol. In a trauma situation, transport should be rapid, with IV, and CPR enroute. In prolonged transport situations, or with the agreement of the EMS system, blunt trauma patients found to be in full cardiac arrest, who are unresponsive to airway maneuvers, may be left at the scene for the coroner (See Special Trauma Problems).
- B. Survival from cardiac arrest is related to the time to BOTH BLS and ALS treatment. Don't forget CPR in the rush for advanced equipment. A call for back-up should be initiated promptly by any BLS unit. Likewise, standing order administration of the first steps in treatment is recommended to minimize time delays to ALS.
- C. See Neonatal and Infant/Child Resuscitation Protocols for special pediatric details.
- D. Large peripheral veins (antecubital or external jugular) are preferred IV sites in an arrest.
- E. Quick-look pads or paddles are preferred for initial rhythm check. Change to leads for more secure reading. Be sure machine is set to record from whichever mode is in use.
- F. Be sure to recheck for pulselessness and unresponsiveness upon arrival, even if CPR is in progress. This will avoid needless and dangerous treatment of "collapsed" patients who are inaccurately diagnosed initially or who have spontaneous return of cardiac function after a dysrhythmia or vasovagal episode.
- G. Patients who have called with chest pain and decompensate to asystole rapidly may benefit from rapid attempts at pacing.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 51 of 304
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## **CHEST PAIN**

### **Specific information needed**

- A. Pain – nature, severity, duration, location, onset, radiation, aggravation, alleviation, relationship to exertion.
- B. Associated symptoms – nausea, vomiting, diaphoresis, respiratory difficulty, cough, fever.
- C. Past history – previous cardiac or pulmonary problems, medications, drug allergies.

### **Specific objective findings**

- A. Vital signs.
- B. General appearance – color, apprehension, sweating.
- C. Signs of heart failure – neck vein distention, peripheral edema, respiratory distress.
- D. Lung exam by auscultation – abnormal breath sounds.
- E. Chest wall tenderness, abdominal tenderness.

### **Treatment – per American Heart Association Guidelines unless otherwise noted**

- A. Reassure and place patient at rest, position of comfort.
- B. O<sub>2</sub>, moderate flow (4-6 L/min). Titrate to pulse oximetry > 90%.
- C. If patient's history suggests a cardiac origin to the chest pain
  - 1. Monitor cardiac rhythm.
  - 2. Obtain 12-lead ECG if equipment is available - transmit to hospital if possible.
  - 3. IV – Saline lock, NS or RL, TKO.
  - 4. Normalize pulse by treating tachycardia > 150 or bradycardia < 60 according to current AHA guidelines.
  - 5. Administer aspirin 162-324 mg chewed.
  - 6. Administer nitroglycerin, 0.4 mg (1/150 grain) SL, if blood pressure > 90 systolic. Repeat every 5 minutes (x3) or until pain relieved or systolic BP < 90 to a maximum of 3 doses.
  - 7. Administer lidocaine if PVCs > 6/minute, multiform or runs present
    - a. Lidocaine bolus, 1 mg/kg body weight slow IV push.
    - b. Lidocaine drip, 1 gm in 250 ml D5W. Begin administration at 2 mg/min (30 microdrops/min).
    - c. Consider 2nd bolus of lidocaine (0.5 mg/kg) IV, 10 minutes after first bolus. Repeat to total of 3 mg/kg.
    - d. \*Consider magnesium sulfate, 1-2 Gm IV over 15 minutes.
  - 8. Administer fentanyl, 0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order) or morphine sulfate, 2-4 mg IV (repeated every 5 minutes, if indicated; do not exceed 0.2 mg/kg) if pain persists after second nitroglycerin and BP > 100 systolic.
- D. If patient's condition is stable, transport promptly without use of lights or siren.
- E. Monitor cardiac rhythm and vitals enroute.

### **Specific precautions**

- A. Suspicion of an acute MI is based on history. Do NOT be reassured by a "normal" monitor strip. Conversely, "abnormal" strips (particularly ST and T changes) can be due

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 52 of 304
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to technical factors or non-acute cardiac diseases. ST elevation that changes after nitroglycerin administration can be significant. Changes should be documented and relayed to physician on arrival at ED.

- B. Constant monitoring is essential. As many as 50% of patients with acute MIs who develop ventricular fibrillation may have no warning dysrhythmias.
- C. Lidocaine should not be given if  
Blood pressure < 90 systolic, or  
Heart rate < 60/minute, or  
Periods of sinus arrest or any A-V block are present, or  
Patient rhythm is atrial fibrillation.
- D. If patient develops depressed respirations following morphine sulfate administration, be prepared to actively support airway and ventilations.
- E. Consider causes other than cardiac for chest pain - pulmonary embolus, dissecting aneurysm, pneumothorax, pneumonitis, etc.
- F. Be particularly cautious to avoid excessive fluids in cardiac patients.
- G. Cardiac Alert program will allow improved time to the cath lab for patients when the ED is notified and ECG faxed to the ED from the field. The improved time of notification will more than compensate for the additional few minutes to take and fax the ECG.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 53 of 304
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## CHILDBIRTH

### Specific information needed

- A. History of pregnancy(s) – due date (EDC), bleeding, swelling of face or extremities, prior problems with pregnancy, prenatal care.
- B. Current problems – if pain, where? Regular? Timing? Ruptured membranes? Vaginal fluid drainage? Urge to push?
- C. Medical history – medications, medical problems, patient's age, number of prior pregnancies, allergies.

### Specific objective findings

- A. Vital signs, particularly any degree of hypertension.
- B. Swelling of face or extremities.
- C. Contraction and relaxation of uterus.
- D. Where privacy is possible, examine perineum for
  1. Vaginal bleeding or fluid – Color? Odor?
  2. Crowning (head visible during contraction)?
  3. Abnormal presentation (foot, arm, cord)?
- E. If delivery occurs, APGAR score of child (1, 5, and 10 minutes after delivery).

### Treatment

- A. If not pushing or bleeding, transport, position of comfort, avoid supine position.
- B. If bleeding is moderate to heavy
  1. O<sub>2</sub>, moderate flow (4-6 L/min). Titrate to pulse oximetry > 90%
  2. IV – volume expander (NS or RL), large bore, TKO or as needed.
- C. Transport immediately – previous cesarean section, multiple births, abnormal presenting part, excess bleeding.
- D. If question of imminent delivery, observe for 1 or 2 contractions, then transport unless delivery is in progress. Be prepared to stop ambulance if delivery occurs enroute.
- E. If delivering
  1. Use clean or sterile technique.
  2. Guide and control but do not retard or hasten delivery.
  3. Suction mouth (to back of mouth only, not throat), and then nose with bulb syringe after head is delivered. Endotracheal suction is preferred with meconium stained amniotic fluid. Keep infant level with perineum.
  4. Suction again after delivery. Stimulate by drying. Keep warm.
  5. Clamp cord in two places 8-10 inches from infant. Cut cord between clamps
  6. Observe infant
    - a. If the baby is limp, has poor color or vital signs (APGAR 7 or less), see Neonatal Resuscitation.
    - b. If the baby is pink, crying and moving well (APGAR 8-10), dry completely, wrap in clean or sterile dry blanket, and place next to mother to conserve heat.
  7. Give infant to mother and allow nursing to aid in uterine contraction.
  8. IV – volume expander (NS or RL), large bore, TKO.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 54 of 304</p>
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9. If excessive bleeding occurs postpartum
  - a. Administer IV fluid bolus, 20 ml/kg.
  - b. Massage fundus, if placenta has been delivered.
10. Transport. Do not wait for or attempt delivery of placenta. If placenta delivers spontaneously, take it to the hospital for inspection. Monitor vitals during transport.

### **Specific precautions**

- A. It is safe to assume that any medical or trauma condition will be complicated by pregnancy. Conversely, pregnancy can be complicated by any trauma or medical condition. The abdominal pain complained of by a pregnant woman may not be uterine contractions. Consider other problems.
- B. Do not pull on cord. Premature delivery of the placenta is accompanied by tearing, partial separation, and occasionally severe bleeding.
- C. Patient with prolapsed cord should be placed in left lateral recumbent position in Trendelenburg. The knee-chest position is generally described as the preferred position, but seems difficult to perform safely in a moving vehicle. If adequate restraints are available to comfortably and safely restrain, knee-chest may be preferred. Gloved hand may be used to keep presenting part of infant from impinging on the cord (in either position).
- D. Eclampsia may complicate any pregnancy. Hypertension (often of mild degree) and peripheral edema are usually evident, and the patient may exhibit behavior changes or muscle irritability. Seizures occurring before or after the time of delivery may cause hypoxic risk to fetus or mother. Keep diazepam handy in case seizures occur, but do not administer prophylactically. Magnesium sulfate may be ordered for hypertension and/or seizures.
- E. Supine hypotension occurs after 20 weeks in some women, due to compression of the inferior vena cava by the gravid uterus. The left lateral recumbent position is optimum for avoiding this.
- F. Ask patient if she feels as though she's delivering. Particularly with prior deliveries, most mothers will know. Subsequent deliveries are frequently faster.
- G. Babies are slippery. It is considered poor form to drop one.
- H. The outside world is cold! Babies have poor temperature regulation and no clothes. Bundle, preferably with mother. It will make them both feel better.
- I. Keep your cool. Women have been delivering babies for many years. In most cases you will do nothing more than preside at a natural event.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 55 of 304
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## COMA

### Specific information needed

- A. Present history – duration of illness, onset and progression of present state; antecedent symptoms such as headaches, seizures, confusion, or trauma.
- B. Past history – previous medical or psychiatric problems.
- C. Medications – use or abuse.
- D. Surroundings – check for pill bottles, syringes, etc, and bring with patient. Note odor in house, general condition of house.

### Specific objective findings

- A. Safety to rescuer – check for gases or other toxins.
- B. Vital signs.
- C. Level of consciousness and neurological status.
- D. Signs of trauma – head, body.
- E. Breath odor.
- F. Needle tracks.
- G. Medical alert tag.

### Treatment

- A. Airway – protect as needed with positioning, NP or OP airways, suctioning, intubation or alternative airway device.
- B. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
- C. IV – volume expander (NS or RL), TKO or as needed.
- D. Test blood for glucose level.
- E. Administer dextrose 50%, 50 ml IV, in secure vein, if glucose level < 60 mg/dl.
- F. Consider naloxone 0.4 mg IV for suspected narcotic toxicity.
- G. Monitor cardiac rhythm.
- H. Transport in lateral recumbent position.
- I. Monitor vitals during transport.

### Specific precautions

- A. Be particularly attentive to airway. Difficulty with secretions, vomiting, and inadequate tidal volume are common.
- B. Hypoglycemia may present as focal neurologic deficit or coma (stroke-like picture) in elderly persons.
- C. Coma in the diabetic may be due to hypoglycemia or to hyperglycemia (diabetic ketoacidosis). Dextrose should be given to all unconscious diabetics, as well as patients with coma of unknown origin unless a reading in the high range is obtained. Do not give oral sugar to an unconscious patient.
- D. Naloxone is useful in any potential overdose situation, but the paramedic should ensure that the airway and the patient are controlled before giving naloxone to a known drug addict. The acute withdrawal precipitated in an addict may result in violent combativeness. It is sometimes preferable to intubate and support, rather than to awaken the patient.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 56 of 304
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## **DYSRHYTHMIAS: GENERAL**

### **Specific information needed**

- A. Present symptoms – sudden or gradual onset, palpitations.
- B. Associated symptoms – chest pain, dizziness or fainting, trouble breathing, abdominal pain, fever.
- C. Prior history – angina, dysrhythmias, cardiac disease, exercise level, pacemaker.
- D. Current medications, particularly cardiac.

### **Specific objective findings**

- A. Vital signs.
- B. Signs of poor cardiac output
  - 1. Altered level of consciousness.
  - 2. "Shocky" appearance – cold clammy skin, pallor.
  - 3. Blood pressure < 90 systolic.
- C. Signs of cardiac failure (increased back-up pressure)
  - 1. Neck vein distention.
  - 2. Lung congestion, crackles (rales).
  - 3. Peripheral edema – sign of chronic failure, not acute.
- D. Signs of hypovolemia
  - 1. Sinus tachycardia, 100 – 150 (usually).
  - 2. Flat neck veins.
  - 3. Poor peripheral perfusion.
  - 4. Evidence of blood loss (see Medical Shock.)
  - 5. Evidence of dehydration (dry mouth, tenting skin, etc.)
- E. Signs of hypoxia.
  - 1. Marked respiratory distress
  - 2. Cyanosis
  - 3. Tachycardia.
- F. Signs of hypothermia
  - 1. Cold skin
  - 2. Decreased level of consciousness.

### **Treatment – per American Heart Association Guidelines unless otherwise noted**

- A. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
- B. IV – NS, TKO.
- C. Evaluate the patient: IS THE PATIENT PERFUSING ADEQUATELY OR ARE THERE SIGNS OF INADEQUATE PERFUSION?
- D. Apply cardiac monitor and evaluate rhythm
  - 1. Is there a pulse corresponding to the monitor rhythm?
  - 2. Rate – tachycardia, bradycardia, normal?
  - 3. Are the ventricular complexes wide or narrow?
  - 4. What is the relationship between atrial activity (P waves) and ventricular activity (QRS-T complexes)?
  - 5. IS THE DYSRHYTHMIA POTENTIALLY DANGEROUS ELECTRICALLY TO THE PATIENT? (See Note D below.)

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 57 of 304</p>
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- E. Document the rhythm with ECG.
- F. Treat if needed according to pulse rate (follow AHA guidelines) or as directed by base physician.
- G. Document results of treatment (or lack thereof) by checking pulse and recording change on paper tape or telemetry.
- H. Transport non-emergent if patient is stable. Monitor condition enroute.

**Specific precautions**

- A. TREAT THE PATIENT NOT THE DYSRHYTHMIA! If the patient is perfusing adequately, he does not need emergency treatment. This is true of bradyrhythms as well as tachyrhythms. What is normal for one person may be fatal to another.
- B. Documentation of dysrhythmias is extremely important. Field treatment of a dysrhythmia may be life-saving, but long-term treatment requires knowing what the problem was. Documentation also allows for learning and discussion after the case. These cases are not common, and should be reviewed and used as learning tools by as many prehospital personnel as possible.
- C. Correct dysrhythmia diagnosis based only on monitor strip recordings is difficult and often not possible. Treatment must be based on observable parameters: rate, patient condition and distance from the hospital. Whenever possible, treatment in the field should be undertaken only after consultation with base physician.
- D. Electrically "dangerous" rhythms are those which do not necessarily cause poor perfusion, but are likely to deteriorate. They require recognition and treatment to prevent degeneration to mechanically significant dysrhythmias. Among the electrically dangerous rhythms are: multiple and multifocal PVCs in the setting of acute ischemia, ventricular tachycardia, and Mobitz II 2nd degree block.
- E. Cardiac arrest and life-threatening dysrhythmias can be successfully treated in the field, and show the benefits of "stabilization prior to transport" in prehospital care. The patient is better off when the duration of arrest or poor perfusion is minimized.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 58 of 304
---	-----------------------	-------------------------------

## **DYSRHYTHMIAS: TACHYCARDIA**

### **Rhythm strip assessment**

- A. Rate, regularity of complexes.
- B. Ventricular complexes – wide (QRS > .12) or narrow.
- C. P waves if detectable and relation to QRS.

### **Indications for treatment**

- A. Signs of poor perfusion – BP < 90 systolic, diaphoresis, confusion, dizziness.
- B. Chest pain.
- C. Signs of hypovolemia (poor perfusion plus low venous pressure).
- D. Pulmonary edema.

### **Treatment – per American Heart Association Guidelines unless otherwise noted**

- A. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
- B. IV – volume expander (NS or RL) TKO or as directed.
- C. If pulse >100 AND < 150, look for signs of hypovolemia and treat according to Medical Shock Protocol.

### **Specific precautions**

- A. Wide complex tachycardias may be ventricular or supraventricular in origin. Treatment should be based on adequacy of perfusion. Assume ventricular tachycardia in the emergency care setting if the patient is symptomatic.
- B. It is most difficult to know how aggressive to be in treating the patient in the "grey" zone: symptomatic but conscious. Discuss with base, consider transport time, patient complaints, and vital signs.
- C. Tachycardia is most likely a secondary problem with rate variation over time or when the pulse < 150. Treat hypoxia, hypovolemia, pain and other problems first.
- D. Unconscious patients (from CVA or other causes) may present with a secondary tachycardia. Unconsciousness due to the tachycardia is usually associated with a rate greater than 180 and poor peripheral pulse.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 59 of 304
---	-----------------------	-------------------------------

## **DYSRHYTHMIAS: NORMAL RATE**

### **Rhythm strip assessment**

- A. Rate.
- B. Regularity, evidence of atrial fibrillation, A-V block.
- C. P waves – relationship to ventricular complexes.
- D. Ectopic beats – wide or narrow?

### **Indications for treatment**

- A. Premature wide complex beats (presumed PVCs) in presence of chest pain
  - 1. > 6 per minute.
  - 2. Multiformed.
  - 3. Couplets or in runs.
  - 4. Closely coupled (QR/QT less than 0.85)
- B. Relative contraindication to treatment for atrial fibrillation, hypotension, age greater than 70 years, or conduction blocks.

### **Treatment – per American Heart Association Guidelines unless otherwise noted**

If no pulse, initiate CPR and treat according to PEA protocol. If pulse

- A. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
- B. IV, volume expander (NS or RL), TKO or as directed.
- C. If BP < 90 systolic – treat for Shock, Medical.
- D. If BP > 90, determine if atrial fibrillation or any conduction block exists (1st, 2nd, or 3rd degree). If so, avoid treatment and discuss options with base.
- E. If BP > 90 and patient in normal sinus rhythm, treat significant PVCs in presence of chest pain with
  - 1. Nitroglycerin, 0.4 mg, SL. Repeat every 5 min to total of 3 doses.
  - 2. Aspirin 162-324 mg P.O. chewed.
  - 3. Fentanyl, 0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order) or morphine sulfate, 2-4 mg IV (repeated every 5 minutes, if indicated; do not exceed 0.2 mg/kg) if pain persists after second nitroglycerin and BP > 100 systolic.
  - 4. Lidocaine 1.0 mg/kg IV, followed by 2 mg/min infusion; may administer 0.5 mg/kg IV after 10 minutes.
  - 5. Consider magnesium sulfate, 1-2 Gm IV over 15 minutes.
- F. Monitor patients with conduction block closely to detect deterioration of rhythm.

### **Specific precautions**

- A. PVCs are common in elderly patients. They should only be treated in the presence of acute cardiac symptoms. Discuss any other indications with base before treatment.
- B. Acute atrial fibrillation may cause hypotension because the atrial "kick" is lost and ventricular filling suddenly becomes less adequate. Acutely, it is usually accompanied by a ventricular response > 150/minute. If the ventricular rate is in the normal range, the rhythm is most likely chronic. Look for other causes of patient deterioration.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 60 of 304
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## **DYSRHYTHMIAS: BRADYCARDIA**

### **Rhythm strip assessment**

- A. Rate.
- B. Relation of P waves to ventricular complexes.
- C. Irregular ventricular complexes (block or atrial fibrillation)?
- D. Ectopic beats – premature or late?

### **Indications for treatment**

- A. Signs of poor perfusion – BP < 90 systolic, diaphoresis, dizziness, confusion, chest pain.
- B. Pulse < 60 in patient > 40 years old.
- C. Presence of premature ventricular contractions or ventricular escape beats.
- D. Relative contraindication to aggressive treatment – atrial fibrillation.

### **Treatment – per American Heart Association Guidelines unless otherwise noted**

- A. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
- B. IV – volume expander (NS or RL), TKO.

### **Specific precautions**

- A. If patient in atrial fibrillation, do not use atropine or dopamine unless absolutely necessary (to avoid provoking uncontrolled ventricular response).
- B. Pain from injury can occasionally cause marked vagal stimulation, with bradycardia and hypotension. This will respond to positioning with legs elevated or administration of atropine or fluids. Pain control may also be helpful.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 61 of 304
---	-----------------------	-------------------------------

## HYPOTHERMIA

### Therapeutic Induced Cooling by EMS (TICE)

Current research has shown that therapeutic hypothermia reduces brain damage following cardiac arrest. EMS plays an important role in beginning the therapeutic hypothermia process which usually must continue for a minimum of 12 hours following cardiac arrest.

#### Specific information needed

- A. Return of Spontaneous Circulation (ROSC) after cardiac arrest NOT related to trauma or hemorrhage.
- B. Age > 18 and not obviously pregnant
- C. The patient is unconscious.
- D. Initial body temperature > 34C (preferably taken by esophageal probe).
- E. Patient must have an established airway, preferably ET or other standard appropriate airway in place

#### Procedure

- A. Establish IV access as close to central circulation as possible (for ex. AC or EJ); consider IO only as a last resort.
- B. Remove clothing, protect modesty.
- C. Apply cold pack to axilla and groin.
- D. Administer the following medications **if patient is shivering or agitated**
  - 1. Vecuronium 0.1 mg/kg to a maximum of 10 mg (only if ETT confirmed in the trachea).
  - 2. Valium 0.2 mg/kg up to 10 mg (may give without vecuronium if patient just agitated) or may use
  - 3. Fentanyl 0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order)
- E. Infuse cold (less than 37F) saline bolus through up to two vascular access points, if possible. Rapidly infuse cold saline at 40 ml/kg to a maximum of 2 liters.
- F. If chilled saline does not maintain systolic blood pressure of 100 or greater, administer dopamine as required to maintain the systolic blood pressure between 100 and 150mmHg. Once the systolic pressure is 150, discontinue dopamine.
- G. Transport to a receiving hospital participating in hypothermia.
- H. Notify the receiving hospital of an I.C.E. alert as soon as possible.

#### Special Considerations

- A. Cold saline is a strong vasoconstrictor. Watch blood pressure closely!
- B. If at any time the patient has a loss of circulation, reduce IV to TKO, remove ice packs, and follow the appropriate protocol.
- C. Monitor EtCO<sub>2</sub>. The target is 40 mm hg. **DO NOT HYPERVENTILATE.**
- D. Attempt to maintain a systolic blood pressure between 100 and 150mmHg.
- E. Repeat fentanyl, diazepam or vecuronium as needed to control agitation and shivering.
- F. Record the patient's temperature prior to cold saline infusion and upon arrival to the E.D.
- G. Record the initial ETCO<sub>2</sub> and continually monitor the ETCO<sub>2</sub>.
- H. If dysrhythmias occur, treat according to the appropriate protocol.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 62 of 304</p>
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## NEUROLOGIC DEFICIT

### Specific information needed

- A. Present history – when last feeling well, difficulty speaking? arm weakness? facial droop? antecedent symptoms – headache?
- B. Past history – head injury, stroke, seizures, diabetes, cardiovascular disease, medications, drug or alcohol abuse.

### Specific objective findings

- A. Vital signs. Level of consciousness. Temperature.
- B. Speech, movement and symmetry of face, extremities.
- C. Medical alert tags.
- D. Signs of dehydration.
- E. Signs of trauma.

### Treatment

- A. Ensure airway. Nasopharyngeal airway may be particularly useful.
- B. Suction frequently and assist ventilations if needed.
- C. O<sub>2</sub>, moderate flow (4-6 L/min). Titrate to pulse oximetry > 90%.
- D. IV – Saline lock or NS, TKO.
- E. Monitor cardiac rhythm.
- F. Consider hypoglycemia. If suggestive
  - 1. Test blood for glucose level.
  - 2. Administer oral dextrose or bolus of dextrose 50%, 50 ml, IV in secure vein, if glucose level < 60 mg/dl.
- G. Transport, lateral recumbent, emergent if necessary.
- H. Monitor vitals during transport.

### Specific precautions

- A. Not all neurologic deficits are caused by stroke. Look for treatable medical conditions – hypoglycemia, hypothermia, hypoxia, hypotension and hyperthermia.
- B. Hypoglycemia is the great mimic. It can present with seizures, coma, behavior problems, intoxication, confusion or stroke-like picture with focal deficits (particularly in elderly patients).
- C. A patient with a stroke can present with aphasia (inability to talk) and still be completely alert and able to hear. Talk to the patient, explain everything that you are doing, and avoid negative comments.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 63 of 304
---	-----------------------	-------------------------------

## POISONS AND OVERDOSES

### Specific information needed

- A. Is there any potential exposure risk to rescuers?
- B. Type of ingestion – What, when, and how much was ingested? Bring the poison, the container, sample of emesis, all medications and everything questionable in the area with the patient to the emergency department.
- C. Reason for ingestion – think of child neglect, attempted suicide.
- D. Symptoms – nausea, burning, eye irritation, respiratory distress, sleepiness.
- E. Past history – medications, diseases.
- F. Action taken by bystanders – induced emesis? "Antidote" given?

### Specific objective findings

- A. Vital signs.
- B. Airway – clear, open, and judge adequacy of ventilations.
- C. Level of consciousness and neurologic status – check frequently.
- D. Breath odor, increased salivation, oral burns.
- E. Skin – sweating, evidence of skin burns.
- F. Eye irritation.
- G. Systemic signs – vomitus, dysrhythmias, lung sounds.

### Treatment

- A. External contamination
  1. Protect rescuer from contamination. Wear appropriate gloves and clothing. Contact Hazardous Materials Unit with any indication of persistent risk.
  2. Remove all clothing and any solid chemical which might provide continuing contamination.
  3. Assess and treat for associated injuries if possible.
  4. Decontaminate patient using running water for 15 minutes prior to transport.
  5. Wrap burned area in clean, dry cloth for transport after irrigation. Keep patient as warm as possible after decontamination.
  6. Check eyes particularly for exposure and rinse with free-flowing water for 15 minutes.
  7. Evaluate for systemic symptoms which might be caused by chemical contamination. Contact base for possible treatment.
  8. Remove rings, bracelets, constricting bands.
  9. Consult base or Poison Control Center (PCC) for special treatment or procedures if needed.
- B. Internal ingestion
  1. If transport time > 20 minutes and ingestion less than 2 hours, consider administering charcoal orally if no contraindications exist.  
**Charcoal Dose:** 1 Gm/kg orally in adult, 1 Gm/kg orally in children.
  2. If patient is poorly responsive or has depressed respirations
    - a. Assess and support ABCs.
    - b. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
    - c. Support patient on side and protect airway.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 64 of 304</p>
---	-------------------------------	--

- d. IV – volume expander (NS or RL), TKO.
  - e. Test blood for glucose level. Administer dextrose 50%, 50 ml, IV in secure vein, if glucose level < 60 mg/dl.
  - f. Consider naloxone, 0.4 mg IV in adult for suspected narcotic toxicity.
  - g. Monitor cardiac rhythm if antidepressant or cardiac drugs ingested.
  - h. Administer sodium bicarbonate 1 mEq/kg IV if widened QRS, prolonged P-R, or ventricular dysrhythmias on monitor after tricyclic antidepressant OD. Repeat if needed in 10 - 15 minutes. Call for further treatment.
3. Monitor vitals and level of consciousness during transport. Do not leave patient unattended.

**Specific precautions**

- A. There are few specific "antidotes." Product labels and home kits can be misleading and dangerous. Watch the ABCs, these are important.
- B. Do not neutralize acids with alkalis. Do not neutralize alkalis with acids. These "treatments" cause heat-releasing chemical reactions which can further injure the GI track.
- C. A commonly missed external contamination is gasoline. Be sure that gasoline spilled on victims is washed off promptly and clothing removed to prevent irritant burns.
- D. Paramedics working with the Hazardous Materials Division of the Colorado Springs Fire Department will have more advanced capabilities and "antidotes" available. Call for assistance whenever toxic exposure is suspected.
- E. Inhalation poisoning is particularly dangerous to rescuers. Recognize an environment with continuing contamination and extricate rapidly or avoid altogether.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 65 of 304
---	-----------------------	-------------------------------

## RESPIRATORY DISTRESS

### Specific information needed

- A. History – acute change or injury, slow deterioration.
- B. Past history – chronic lung or heart problems or known diagnosis, medications, home oxygen, past allergic reactions, recent surgery, diabetes, possible toxic exposure
- C. Associated symptoms – chest pain, cough, hand or mouth paresthesias, fever.

### Specific objective findings

- A. Vital signs.
- B. Oxygenation – color, level of consciousness.
- C. Ventilatory effort – accessory muscle use, forward position, pursed lips.
- D. Neurologic signs – slurred speech, impaired consciousness, evidence of drug/alcohol ingestion.
- E. Signs of upper airway obstruction – hoarseness, drooling, exaggerated chest wall movements, inspiratory stridor.
- F. Signs of congestive failure – neck vein distention in upright position, wet crackling lung sounds, peripheral edema.
- G. Breath sounds – clear, abnormal breath sounds.
- H. Hives, upper airway edema.
- I. Evidence of trauma – crepitus of neck or chest, bruising, steering wheel damage, penetrating wounds.

### Treatment

- A. Put patient in position of comfort (usually upright).
- B. O<sub>2</sub> – flow as necessary for patient comfort. Administer high flow oxygen for respiratory distress with no evidence COPD. Titrate to pulse oximetry > 90% if possible.  
*In COPD use O<sub>2</sub>, 1-2 L/min or 1 L/min over home flow. Increase by 1-2 L/min as needed if cyanosis persists. Pulse oximetry reading > 80% may be sufficient. Titrate to comfort; be prepared to assist ventilations if necessary.*
- C. Assess and consider treatment for the following problems if respiratory distress is severe and patient does not respond to proper positioning and administration of O<sub>2</sub>
  1. Asthma
    - a. IV – volume expander (NS or RL), TKO if respiratory distress severe.
    - b. Monitor cardiac rhythm as needed
    - c. Albuterol, 2.5 mg by nebulizer (repeat as needed).
    - d. Ipratropium 0.5 mg with albuterol 2.5 mg by nebulizer.
    - e. Dexamethasone 10 mg IV.
    - f. Consider epinephrine 1:1,000 SQ or IM 0.3 ml in adults less than 40 years of age.
    - g. Consider magnesium sulfate one gram slowly IV.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 66 of 304</p>
---	-------------------------------	--

2. Pulmonary edema
    - a. Sit patient up, legs dangling if possible.
    - b. IV TKO or saline lock
    - c. Monitor cardiac rhythm.
    - d. Assist ventilations and consider intubation or alternative airway device if patient has altered mentation. Consider PEEP or CPAP.
    - e. Nitroglycerin, 0.4 mg, SL. (Repeat every 3-5 min as long as systolic BP > 90 to total 3 tabs/sprays.)
    - f. Furosemide, 20-40 mg IV.
  3. Chronic lung disease with deterioration
    - a. O2, low flow (1-2 L/min or 1 L/min > home flow).
    - b. Monitor cardiac rhythm.
    - c. IV – Saline lock or D5W, TKO.
    - d. Albuterol, 2.5 mg by nebulizer (repeat as needed).
    - e. Dexamethasone 10 mg IV.
    - f. Ipratropium 0.5 mg with albuterol 2.5 mg by nebulizer.
    - g. Assist ventilations and consider intubation or alternative airway device if patient has altered mentation. Consider PEEP or CPAP.
  4. Pneumothorax: watch for signs of tension. If patient deteriorating rapidly, consider decompression.
- D. If diagnosis is unclear, place patient in position of comfort, and administer oxygen. Transport rapidly for severe distress.
- E. Prepare to assist ventilations if patient fatigues or develops altered mentation, or if respiratory arrest occurs.

**Specific precautions**

- A. Don't over diagnose "hyperventilation" in the field. The patient could have a pulmonary embolus or other serious problem. Give them the benefit of the doubt. Treatment with oxygen will not harm the patient with hyperventilation, and it will prevent underestimation of the problem.
- B. Wheezing in older persons may be due to pulmonary edema ("Cardiac Asthma"). Consider also pulmonary embolus or foreign body as less common causes of wheezing.
- C. Do not over treat the COPD patient with oxygen. Diminished anxiety and respiratory struggle may presage a full cardiopulmonary arrest. Start with 1-2 L/min (or 1 L/min over home O2 flow). O2 may be increased in 1-2 L/min increments if cyanosis or air hunger still present.
- D. Patients with COPD and respiratory distress are commonly seen in the field and are difficult to evaluate. Albuterol is relatively safe in these patients and can be administered as a constant (or repetitive) nebulization. Occasionally the patient with COPD must be transported rapidly with supportive care only. You cannot clear acute-superimposed-upon-chronic respiratory failure in a few minutes. Intubate only if absolutely necessary.

**Table 2.1 BREATH SOUNDS IN RESPIRATORY DISTRESS**

Auscultation	Location	Possible diagnosis
Clear	Bilateral	MI, metabolic, pulmonary embolus, Anxiety, toxin.
Decreased	Bilateral	COPD
	Localized	COPD, pneumothorax, pulmonary embolus, Pneumonia.
Crackles (rales) (inspiration)	Bilateral	Pulmonary edema, Pneumonia.
	Localized	Pneumonia, pulmonary Edema
Wheezes (expiration)	Bilateral	Asthma, occasionally pulmonary edema, Embolus.
	Localized	Foreign body, embolus, COPD
Rhonchi (coarse, wet sounds)	Bilateral	Bronchitis, COPD.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 68 of 304
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## SEIZURES

### Specific information needed

- A. Seizure history – onset, time interval, previous seizures, type of seizure.
- B. Medical history – especially head trauma, diabetes, headaches, drugs, alcohol, medications, pregnancy.
- C. In the field status epilepsy is considered to be any seizure lasting more than 5 minutes, or two consecutive seizures without regaining consciousness.

### Specific objective findings

- A. Vital signs.
- B. Description of seizure activity.
- C. Level of consciousness.
- D. Head and mouth trauma.
- E. Incontinence.
- F. Air temperature, patient temperature.
- G. Skin color and moisture.

### Treatment

- A. Airway – ensure patency - nasopharyngeal airways useful. NOTE: Do not FORCE anything between the teeth.
- B. O<sub>2</sub>, moderate flow (4-6 L/min). Titrate to pulse oximetry > 90%.
- C. Suction as needed.
- D. If seizure persists or patient not alert.
  - 1. Protect patient from injury.
  - 2. Check pulse immediately after seizure stops. Keep patient on side.
  - 3. IV – Saline lock, NS, or RL, TKO.
  - 4. Test blood for glucose level.
  - 5. Administer dextrose 50%, 50 ml IV into secure vein, if glucose level < 60 mg/dl.
  - 6. Consider naloxone, 0.4 mg IV for suspected narcotic toxicity.
  - 7. Consider benzodiazepine per protocols.
  - 8. Consider magnesium sulfate 1-2 grams slowly IV for the pregnant patient with suspected eclampsia.
- E. Monitor cardiac rhythm.
- F. Keep in lateral recumbent position for transport.
- G. Monitor vitals.

### Specific precautions

- A. Move hazardous materials away from patient. Restrain patient only if needed to prevent injury. Protect patient's head.
- B. Trauma to tongue is unlikely to cause serious problems. Trauma to teeth may. Attempts to force an airway into the patient's mouth can completely obstruct airway. Do not use bite sticks.
- C. Seizure can be due to lack of glucose or oxygen to the brain, as well as to the irritable focus we associate with epilepsy. Hypoxia from transient dysrhythmia or cardiac arrest

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 69 of 304
---	-----------------------	-------------------------------

- (particularly in younger patients) may cause seizure and should be treated promptly. Don't forget to check for pulse once a seizure terminates.
- D. Hypoxic seizures can also be caused by a simple fainting, either when the tongue obstructs the airway in the supine position, or when overly helpful bystanders "prop" the patient upright or elevate the head prematurely.
  - E. Alcohol-related seizures are common, but cannot be differentiated from other causes of seizure in the field. Assessment in the intoxicated patient should still include consideration of hypoglycemia and all other potential causes.
  - F. In patients over the age of 50, seizures may be due to dysrhythmias or stroke. Of these, dysrhythmia is the most important to recognize in the field.
  - G. Medical personnel are often called to assist epileptics who seize in public. If the patient clears completely, is taking his medications, has his own physician, and is experiencing his usual frequency of seizures, transport may be unnecessary. Consult your base physician.
  - H. Seizures in pregnant patients (or even those who are recently delivered) may be the presenting sign of eclampsia or toxemia of pregnancy. Seizures in pregnant patients are better treated by administration of magnesium sulfate.
  - I. The status epilepticus patient may be a candidate for rapid sequence induction.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 70 of 304
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## **SHOCK: MEDICAL**

### **Specific information needed**

- A. Onset – gradual or sudden, precipitating cause or event.
- B. Associated symptoms – itching, peripheral or facial edema, thirst, weakness, respiratory distress, abdominal or chest pain, dizziness on standing.
- C. History – allergies, medications, bloody vomitus or stools, significant medical diseases, history of recent trauma, last menstrual period, vaginal bleeding, fever.

### **Specific objective findings**

- A. Vital signs – pulse > 120 (occasionally < 50); BP < 90 systolic.
- B. Mental status – sleepy, apathy, confusion, restlessness, mania.
- C. Skin – flushed, pale, sweaty, cool or warm, hives, or other rash.
- D. Signs of trauma, particularly blunt.
- E. Signs of pump failure (back-up pressure) – jugular venous distention in upright position, wet lung sounds, and peripheral edema (indicates chronic pump failure).

### **Treatment**

- A. Stop exsanguinating hemorrhage.
- B. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
- C. Cover patient to avoid excess heat loss. Do not over bundle.
- D. Assess for hypovolemia. Treat as indicated.
  - 1. IV – volume expander (NS or RL), large bore, TKO or as directed.
  - 2. Consider fluid challenge
- E. Assess for cardiogenic cause
  - 1. If P > 150, treat tachydysrhythmia according to AHA guidelines.
  - 2. If P < 60, treat bradydysrhythmia according to AHA guidelines.
  - 3. If distended neck veins, chest pain, or other evidence of cardiac cause
    - a. Be prepared to assist ventilations or initiate CPR.
    - b. IV – volume expander (NS or RL), large bore, TKO or as directed.
    - c. Consider dopamine drip – begin at 5 mcg/kg/min IV.
    - d. Consider fluid challenge, 250 ml IV.
    - e. Transport rapidly for definitive diagnosis and treatment.
- F. Consider anaphylaxis. Treat as appropriate.
- G. If no evidence of specific cause, institute general treatment measures
  - 1. Place patient supine; elevate legs 10-12 inches. (If respiratory distress results, leave patient in position of comfort.)
  - 2. IV – volume expander (NS or RL), large bore, 20 ml/kg rapid IV, then TKO or as directed.
- H. Monitor VS, cardiac rhythm, and level of consciousness during transport.

### **Specific precautions**

- A. Shock in a cardiac patient may still represent hypovolemia. Administer small fluid boluses (250 ml) and monitor response closely. Watch for signs/symptoms of pulmonary edema.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 71 of 304</p>
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## **SYNCOPE**

### **Specific information needed**

- A. History of the event – precipitating factors, onset, duration, seizure activity. Was the patient sitting, standing, or lying? Pregnant?
- B. Past history – medications, diseases, prior syncope, trauma.
- C. Associated symptoms – dizziness, nausea, chest or back pain, abdominal pain, headache, palpitations.

### **Specific objective findings**

- A. Vital signs.
- B. Neurologic status – level of consciousness, residual neurologic deficit.
- C. Signs of head trauma, mouth trauma, incontinence.
- D. Neck stiffness.

### **Treatment**

- A. Position of comfort. DO NOT sit patient up prematurely. Supine or lateral positioning if not completely alert.
- B. Monitor vital signs and level of consciousness closely for changes.
- C. Consider hypoglycemia. If suggestive
  - 1. Test blood for glucose level.
  - 2. Administer oral dextrose or bolus of dextrose 50%, 50 ml, IV in secure vein if glucose level < 60 mg/dl.
- D. If vital signs unstable or symptoms persist,
  - 1. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
  - 2. Keep patient supine, elevate legs 10-12 inches.
  - 3. IV – volume expander (NS or RL), TKO or as directed.
  - 4. Monitor cardiac rhythm.

### **Specific precautions**

- A. Most syncope is vasovagal, with dizziness to fainting over several minutes. Recumbent position should be sufficient to restore vitals.
- B. Syncope which occurs without warning or in a recumbent position is potentially serious, and often caused by dysrhythmia.
- C. Patients over the age of 40 with syncope, even though apparently normal, should be transported. Consider dysrhythmias, occult GI bleeding, seizure, or leaking abdominal aortic aneurysm.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 72 of 304
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## VAGINAL BLEEDING

### Specific information needed

- A. Symptoms – cramping, passage of clots or tissue, dizziness, weakness, thirst
- B. Present history – duration, amount, last menstrual period (normal or abnormal), and birth control method. If pregnant – due date. If postpartum – time and place of delivery, current medications.
- C. Past history – medications, bleeding problems, pregnancies, sexual assault.

### Specific objective findings

- A. Vital signs.
- B. Evidence of blood clots, or tissue fragments (bring tissue to ED).
- C. Signs of hypovolemic shock – altered mental status, hypotension, tachycardia, sweating, skin pallor, or rash (purpura).

### Treatment

- A. O<sub>2</sub>, moderate flow (4-6 L/min). Titrate to pulse oximetry > 90%.
- B. If BP < 90 systolic and signs of hypovolemic shock
  - 1. With early or no apparent pregnancy
    - a. Elevate legs 10 inches and keep patient warm.
    - b. IV – volume expander (NS or RL), large bore, wide open 20 ml/kg, further fluids as directed.
  - 2. With mid or late pregnancy
    - a. Position left lateral recumbent and keep patient warm.
    - b. IV enroute – volume expander (NS or RL), large bore, wide open 20 ml/kg, further fluids as directed.
    - c. Transport rapidly if bleeding severe.
  - 3. If patient postpartum (within 24 hours)
    - a. Massage uterus.
    - b. IV – as above for hypovolemic shock.

### Specific precautions

- A. Amount of vaginal bleeding is difficult to estimate. Visual estimates from sheets or towels can be misleading. PELVIC EXAM IN THE FIELD IS NOT INDICATED.
- B. A patient in shock from vaginal bleeding should be treated like any patient with hypovolemic shock. Vaginal bleeding in late pregnancy, however, may make consideration of appropriate destination more pertinent. Any complication of pregnancy should be transported to the nearest facility that can appropriately manage those complications.
- C. If patient could be pregnant, bring in any tissue which has been passed. Laboratory analysis may be important in determining status of pregnancy.
- D. Consider possibility of sexual assault in the very young or infirm.
- E. Always consider pregnancy as a cause of vaginal bleeding. The history may contain inaccuracies, denial, or wishful thinking.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 73 of 304</p>
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## **VOMITING OR DIARRHEA**

### **Specific information needed**

- A. Frequency, duration of vomiting, diarrhea.
- B. Presence of blood in vomitus, stool.
- C. Associated symptoms – abdominal pain, weakness, confusion.
- D. Medication ingestion.
- E. Past medical history – diabetes, cardiac disease, abdominal problems, alcoholism, recent travel, and several persons affected.

### **Specific objective findings**

- A. Vital signs.
- B. Color of vomitus, diarrhea, presence of blood.
- C. Abdomen – tenderness, guarding, rigidity, distention.
- D. Signs of dehydration – poor skin turgor, tearless eyes, dry mucous membranes, confusion.

### **Treatment**

- A. Position patient, left lateral recumbent if vomiting, otherwise supine. Protect airway as needed.
- B. O<sub>2</sub>, moderate flow (4-6 L/min). Titrate to pulse oximetry > 90%.
- C. Nothing by mouth.
- D. Consider antiemetic per protocols.  
Avoid use in children younger than 1 month of age.
- E. If BP < 90 systolic and signs of hypovolemic shock
  - 1. Elevate legs 10-12 inches.
  - 2. IV – volume expander (NS or RL), large bore, 20 ml/kg wide open, further fluids as directed.
- F. Monitor vital signs during transport.

### **Specific precautions**

- A. Vomiting or diarrhea may be symptoms of a more serious problem, but all cause some degree of hypovolemia. The most serious causes are GI bleed or other intra-abdominal catastrophe. A rare cardiac patient may also present with vomiting or diarrhea as the predominant symptom.
- B. The vast majority of persons with vomiting and diarrhea have become sick over days, not minutes. Unless severely ill, they do not require lights-and-siren transport or advanced field treatment.
- C. Dehydration may be particularly severe in children with simple vomiting and diarrhea. IVs may be very difficult to start, particularly with infants. Transport for definitive treatment is usually best.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 74 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	<b>Document #</b> 04-2010	<b>Rev.:</b> <b>Page #:</b> 75 of 304
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**CHAPTER 3**

**PEDIATRIC TREATMENT PROTOCOLS**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 76 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 77 of 304
---	-----------------------	-------------------------------

### **PEDIATRIC TREATMENT OVERVIEW**

Pediatric patients are not just "small people." They have unique needs and problems that will affect prehospital as well as hospital care. These differences are all the more important to remember, because infants and children make up a small part of our patient population and opportunities to practice assessment and management skills are infrequent. In addition, the pediatric emergency is rarely preceded by chronic disease. If intervention is swift and effective, the child can often be restored to full health. This makes the psychological burden and reward for us as providers all the greater.

The following principles should be remembered

- A. Airways are smaller, softer, and easier to obstruct or collapse.
- B. Respiratory reserve is small. Minor insults such as improper positioning, vomitus, stomach filled with air, or airway narrowing can lead to major problems.
- C. Circulatory reserve is also small. The loss of one unit of blood is sufficient to account for severe shock or death in an infant. Conversely, 500 ml of unnecessary fluid can result in acute pulmonary edema.
- D. Vital signs and level of consciousness are difficult to assess. History, a high index of suspicion, and "soft signs" can be critical. Listen to the parents. They know when changes have occurred, even if they have difficulty expressing what has changed.
- E. Electrolyte solutions should always be used in pediatric IVs. D5W is not indicated for infants or children.
- F. The proper size of equipment is very important because of the child's poor cardiorespiratory reserve. A complete selection of laryngoscope blades, ET tubes, suction catheters and IV catheters is essential for optimal care.
- G. Pediatric equipment and drugs should be stored separately so they can be found easily when needed.
- H. Pediatric resuscitation skills must be practiced to be ready when needed. In addition, protocols should be kept simple and procedures with poor likelihood of success should be left to the hospital setting if simpler support and rapid transport will suffice to maintain the patient.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 78 of 304
---	-----------------------	-------------------------------

## **INFANT AND CHILD RESUSCITATION**

### **Specific information needed**

- A. History – what happened, when was child found, recent illness?
- B. Past history – diseases, medications.
- C. Surroundings – evidence of abuse, neglect, poisoning.

### **Specific objective findings**

- A. Absence of consciousness.
- B. Terminal or no respirations.
- C. Absence of central pulse (carotid or femoral).
- D. Color, temperature.
- E. Signs of trauma.

### **Treatment**

- A. Open airway and attempt ventilation.
- B. If airway obstructed
  - 1. Attempt to visualize airway with laryngoscope and remove any obvious foreign body.
  - 2. Reposition airway.
  - 3. Attempt to ventilate.
  - 4. If unsuccessful, follow AHA guidelines.
  - 5. Consider needle cricothyrotomy if obstruction unrelieved.
- C. Check pulse once ventilations established. Begin chest compressions if no pulse.
- D. Check rhythm with monitor or quick-look paddles. Follow AHA guidelines.

### **Specific precautions**

- A. Pediatric arrests are most likely to be primary respiratory events. The rescuer's primary attention, therefore, must be directed to ensure both airway and good ventilations before any concerns for the cardiac rhythm. Any cardiac rhythm can spontaneously convert to NSR in a well-ventilated child.
- B. Infants and children have a much greater capacity than adults to recover from cardiorespiratory arrest. CPR should be started if there is any possibility of recovery. If the chances appear poor, basic CPR with rapid transport will still allow the relatives to receive the emotional and social support of the hospital environment. Conversely, children who are cold, rigid and mottled should be left at the scene after notification and arrival of responsible law enforcement personnel.
- C. SIDS (Sudden Infant Death Syndrome) will be one of the most frequent causes of cardiorespiratory arrest in infants between the ages of 1 month to 1 year. The parents or caretakers will have a great deal of guilt feelings. If these feelings are recognized and addressed it can help prevent some of the long-term effects of this devastating occurrence. Unfortunately, SIDS can be very hard to distinguish from child abuse and vice versa. Therefore it is most important not to be judgmental or suggest a diagnosis when there is not enough information to be accurate.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 79 of 304
---	-----------------------	-------------------------------

- D. Cardiorespiratory arrest in a trauma situation (as with an adult) is best treated with rapid transport with CPR enroute. IVs may be established and fluids administered during transport.
- E. The most successful infant resuscitations occur BEFORE a full cardiopulmonary arrest. Assess infants carefully and assist with airway, breathing, and circulatory problems BEFORE the arrest occurs to improve the overall care to the pediatric patient.
- F. Note the following differences in pediatric drug doses:
  - 1. Sodium bicarbonate is administered as half-strength solution (4.2%) for infants 30 days or less. Use premixed pediatric ampules or dilute adult strength 1:1 with saline. Dose is 1 mEq/kg or 2 ml/kg of the 4.2% solution.
  - 2. Epinephrine is given in the 1:10,000 strength IV or the 1:1,000 strength SQ or IM.
  - 3. Dextrose 25% (dilute 1:1 with saline or sterile water), 2-4 ml/kg of 25% solution.
  - 4. For IVs – RL or NS is preferred.
- G. The Pediatric Resuscitation Tape is a simple and effective way to have multiple bits of data available to assist with infant and pediatric resuscitation. The tape is designed to place beside the youngster. Drugs and equipment are pre-measured and calculated such that by reading off the tape at the appropriate length of the patient, the approximate weight is given with equipment size listing and critical drug dosages. Its use is recommended.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 80 of 304
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## NEONATAL RESUSCITATION

### Specific information needed

- A. History of mother – age, due date, prenatal care, previous pregnancies and problems, medications, duration of labor, foul-smelling or stained amniotic fluid.
- B. History of infant – if already delivered, when was delivery. How has infant behaved since delivery? What has been done for infant?

### Specific objective findings

- A. Vital signs, APGAR score at 1, 5 and 10 minutes.
- B. Temperature or warmth of skin. Color. Spontaneous movement.
- C. Meconium (brown/green/black stool fragments) in amniotic fluid or in newborn's airway.

### Treatment

- A. If baby is not delivered and head is not appearing at vaginal opening with contractions, transport rapidly and prepare to stop for delivery enroute if situation changes.
- B. If baby is not delivered, but head visible with contractions (crowning), delivery is imminent.
  1. Set up clean or sterile area for delivering baby
    - a. Place sterile or clean drape between mother's legs.
    - b. Set sterile clamps, scissors, and suction on drape.
    - c. Put on sterile gloves.
    - d. Assign one attendant to mother, second to infant.
  2. As infant's head is delivering, put very gentle pressure against it with several fingers flat against head (not finger tips) to prevent an explosive delivery.
  3. As soon as head has delivered, use bulb suction to clear mouth (to back of mouth only, not throat) then nose (before delivery of infant's body if possible).
  4. Suction immediately after delivery also, using bulb syringe to suction first the mouth, then the nose. Stimulate by drying with clean towel or blanket, administer O2 near face.
  5. If apparent meconium and respiratory difficulty –
    - a. Suction on the perineum prior to delivery of shoulders.
    - b. If baby not vigorous, suction airway under direct laryngoscopic vision using catheter or ET tube to remove visible meconium from the airway or until heart rate drops to 60 bpm.
- C. After baby delivered, assess general appearance.
  1. If infant pink, with good cry and active movement (APGAR 8-10)
    - a. Wrap in clean, dry blanket.
    - b. Keep infant level with perineum.
    - c. Clamp cord in two places 8-10 inches from infant.
    - d. Cut cord between clamps.
    - e. Bundle infant with mother, continue to monitor.
  2. If infant color poor, weak cry, or limp (APGAR 7 or less)
    - a. Follow current AHA guidelines.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 81 of 304
---	-----------------------	-------------------------------

### **Specific precautions**

- A. Neonatal resuscitation, unlike most other resuscitation situations, requires careful attention to temperature. For neonates the management priorities are
- A Airway
  - B Breathing
  - C Circulation
  - T Temperature
- The newborn has very poor temperature control and circulatory and respiratory status is often entirely dependent on core temperature. If infant requires resuscitation, place in dry blanket on Porta-Warmer or other infant warming system. Wrap warmer and infant with silver swaddling if possible to aid in heat conservation.
- B. Avoid overstimulation of the back of the pharynx during suctioning. This may cause bradycardia in newborn. Do suction nares, as babies breathe only through nose for the first few months.
- C. If thick meconium is present in upper airway or an adequate airway cannot be obtained, use laryngoscope and suction through the endotracheal tube to clear airway under direct vision and avoid contamination of the lungs with meconium as much as possible. This should only be done under dire circumstances, since it is time-consuming and can cause heat loss and hypoxia – minimize the time of suctioning.
- D. Airway management should be kept as simple as possible. Oxygen delivered by tube to the area of baby's face is usually all that is needed to aid in resuscitation. Bag-valve-mask respirations and endotracheal intubation should be considered only if initial oxygen provision fails to revive the neonate.
- E. Infants, particularly preemies, are very fragile. In most instances, basic stabilization by airway control, suctioning, temperature conservation and CPR enroute to the hospital is recommended. This is not the time to try IVs, drugs, or other ALS procedures in the field.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 82 of 304
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## **PEDIATRIC RESPIRATORY DISTRESS**

### **Specific information needed**

- A. Present symptoms – sudden or gradual onset.
- B. History of oral exposures – toys, food, chemicals, etc.
- C. Associated symptoms – cough, fever, upper respiratory symptoms, runny nose, sore throat, drooling, and hoarseness.
- D. Past medical problems.
- E. Current medications.

### **Specific objective findings**

- A. Mental status – alert, agitated, confused, somnolent.
- B. Respiratory effort – upper airway sounds, chest wall movement, use of accessory muscles, retractions (depressions between ribs on inspiration).
- C. Audible breathing noise – wheezes, cough, crowing.
- D. Lungs by auscultation – abnormal breath sounds.
- E. Other findings – drooling, fever, skin color.

### **Treatment**

- A. Put patient in position of comfort (usually upright).
- B. If respiratory arrest – attempt to ventilate. Watch neck position carefully and adjust for maximum chest rise.
- C. If patient has airway obstruction from foreign body
  - 1. Encourage coughing efforts with partial obstruction.
  - 2. If no air movement, visualize airway with laryngoscope and remove any obvious foreign body.
  - 3. Reposition the airway.
  - 4. Attempt to ventilate.
  - 5. If unsuccessful, follow AHA guidelines.
  - 6. If unsuccessful, consider percutaneous cricothyrotomy with 14 g. angiocath if qualified.
- D. Apply O<sub>2</sub>, high flow (10-15 L/min or volume sufficient to keep bag inflated) for significant respiratory distress. Titrate to pulse oximetry > 90% if possible.
- E. If patient is ventilating inadequately
  - 1. Assist ventilations as needed with bag-valve-mask and high flow oxygen.
  - 2. Consider intubation if less invasive means is inadequate.
- F. Assist and consider treatment for the following problems if respiratory distress is severe and patient does not respond to proper positioning and administration of O<sub>2</sub>
  - 1. Croup
    - a. Administer racemic epinephrine 1:1000 0.3-0.5 ml (depending on age) with 2 ml saline via nebulizer.
    - b. Prepare to assist ventilations if child fatigues and is unable to maintain adequate ventilations.
  - 2. Epiglottitis
    - a. Allow patient to remain upright.
    - b. Assist with removal of secretions if needed.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 83 of 304</p>
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- c. For long transport with severe distress, administer racemic epinephrine by updraft nebulizer as above.
- d. Prepare to assist ventilations.
- 3. Asthma
  - a. Administer albuterol 1.5-3.0 ml 0.083% solution (1.5 ml under age 2, 3.0 ml over age 2) via nebulizer.
  - b. Administer epinephrine, 0.01 ml/kg of 1:1,000 SQ or IM, or 0.1 ml of 1:10,000 IV, if no improvement with albuterol or immediately with severe respiratory distress.
- G. If diagnosis is unclear, transport patient rapidly with supplemental O<sub>2</sub>, and prepare to assist ventilations if child becomes fatigued or sustains respiratory arrest.

**Specific precautions**

- A. If respiratory arrest occurs in a child with croup, epiglottitis or laryngeal edema it is probably due to exhaustion or spasm. They may still be ventilated with pocket mask or bag-valve-mask (BVM) technique. Don't attempt intubation unless these techniques fail.
- B. Intubation of children in the field is infrequently performed, and therefore carries some risk. Do not attempt intubation if a simpler skill will manage the airway.
- C. Bag-valve-mask in small children carries the risk of excessive pressures and possible pneumothorax. It is easy to get overly excited and over ventilate.
- D. In respiratory distress of sudden onset, think of foreign body aspiration. The mouth is a major sensory organ for children and admits a multitude of obstructive hazards.
- E. There may be a call to attend a child who has allegedly aspirated something that was in his or her mouth, but is now asymptomatic. This child may not need emergency intervention, but should be seen by a physician. Once the object has settled in the lung and is not irritating a major airway, it can rapidly become asymptomatic while still requiring removal to prevent further complications.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 84 of 304
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## **PEDIATRIC SEIZURES**

### **Specific information needed**

- A. History – onset, duration of seizure, description of seizure activity, fever, recent illness.
- B. Past history – immunizations, medications, previous seizures, diseases.

### **Specific objective findings**

- A. Vital signs.
- B. Level of consciousness.
- C. Fever, skin temperature, rash.
- D. Signs of trauma.

### **Treatment**

- A. Ensure airway, suction as needed.
- B. O<sub>2</sub>, moderate flow (4-6 L/min). Titrate to pulse oximetry > 90%.
- C. Remove excess clothing if patient feels febrile.
- D. Keep patient on side. Protect from injury during confusion or further seizure.
- E. If seizure persists or patient not alert
  - 1. IV – RL or NS. Start enroute at TKO.
  - 2. Test blood for glucose level.
  - 3. If glucose level < 60 mg/dl, administer 2-4 ml/kg 25% dextrose into secure vein.
  - 4. Administer benzodiazepine per protocol if seizure activity persists. Be prepared to intubate if respiratory depression significant.
- F. Monitor vitals carefully enroute. Keep patient on side.

### **Specific precautions**

- A. If patient is obviously febrile, remove clothing. DO NOT DELAY TRANSPORT FOR COOLING. Unbundling is often sufficient.
- B. Unlike the adult with a diagnosis of epilepsy, a child who has had a seizure, even though alert on arrival of the paramedics, usually requires medical attention. He is best transported by ambulance.
- C. Seizures in children may not be the usual grand mal type. A staring, peculiar eye movement, unresponsiveness, or arm twitching may be the only clue. The parents are usually very sensitive to the abnormality and potential seriousness of the situation. Do not downplay their concerns.
- D. Do not make the diagnosis of "febrile seizures" in the field. This diagnosis cannot be made until other causes are excluded. An important cause of seizures in childhood is meningitis (also associated with a fever). Other forms of encephalitis, head trauma, and epilepsy must also be excluded.

## PEDIATRIC TABLES

**Table 3.1 APGAR SCORE**

Observation	2	1	0
Appearance (Color)	Pink	Pink Body Blue Limbs	Blue
Pulse (heart rate)	> 100	< 100	None
Grimace (reflex irritability)	Cough Sneeze	Grimace	Non-responsive
Activity (muscle tone)	Active	Flexion of extremities	Limp
Respirations	Good cry	Slow, irregular	None

Neurologic evaluation of the newborn is best accomplished by using the APGAR scoring system. This system, like the Glasgow Coma Scale for adults, shows a great deal of inter-observer reliability and also has some prognostic value. Healthy, normal infants usually score between 8 and 10, while infants scoring less than 7 require significant resuscitative efforts.

It is unlikely that most paramedics will deliver enough infants to easily score the newborns he or she encounters. The important point is to make the necessary observations. If these are made accurately, a numerical score can be derived later. Thus, it is important to note the COLOR of the infant, his HEART and RESPIRATORY RATE. Note his MUSCLE TONE when he is picked up. Finally, when suctioning, note the REFLEX IRRITABILITY when the catheter is placed into his nose and posterior pharynx. The APGAR score is usually noted at one minute and at five minutes after birth. If the baby is unstable the observations should be repeated every 5 minutes. **DO NOT DELAY RESUSCITATION WHILE TRYING TO CALCULATE THE APGAR SCORE.**

**Table 3.2 NORMAL VITAL SIGNS IN THE PEDIATRIC AGE GROUP**

AGE	PULSE Beats/min	RESPIRATIONS Rate/min	BLOOD PRESSURE Systolic
Premature	144	20-38	N/A
Newborn	140	20-38	N/A
6 month	130	20-30	80
1 year	125	20-24	90
3 years	110	20-24	95
5 years	100	20-24	95
8-10 years	90	12-20	100

**Table 3.3 PEDIATRIC AIRWAY SIZES**

AGE	ORAL AIRWAY	ENDOTRACHEAL TUBE (uncuffed)	SUCTION CATHETER
Premature	00	2.5-3.0	5 French
Newborn	0	3.0-3.5	6 F
6 month	0-1	3.5	8 F
1 year	1	4.0	8 F
3 years	2	4.5	10 F
5 years	2-3	5.0	10 F
8 years	3	6.0 cuffed	10 F
Older	4	6.5-7.0 cuffed	12 F

**Table 3.4 PEDIATRIC TREATMENT REFERENCE**

TREATMENT	SOLUTION		ADMINISTRATION
Adenosine	3 mg/ml		0.1 mg/kg
Albuterol	3 mg/ml		1.5 ml < 2 yrs 3.0 ml > 2 yrs
Atropine	0.1 mg/ml		0.02 mg/kg
Defibrillation			2 joule/kg
Dextrose 25%	250 mg/ml		0.5-1 g/kg
Diazepam	5 mg/ml		0.04 ml/kg (0.2 mg/kg)
Epinephrine (0.01 mg/kg)	1:10,000 0.1 mg/ml	IV/IO	0.01 mg/kg
	1:1,000 1 mg/ml	SQ or IM ET	0.01 mg/kg 0.1 mg/kg
IV fluids	NS or RL		20 ml/kg
Lidocaine	20 mg/ml		1.0 mg/kg
Morphine (0.1 mg/kg)	10 mg/ml		0.01ml/kg
Naloxone	0.4 mg/ml		0.1 mg/kg <5 yrs or 20kg Up to 2mg >5 yrs or 20kg
Sodium Bicarbonate	0.5 mEq/ml 4.2% for infants 30 days or less		2 ml/kg
	1.0 mEq/ml 8.4% for infants > 30 days		1 ml/kg

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 88 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	<b>Document #</b> 04-2010	<b>Rev.:</b> <b>Page #:</b> 89 of 304
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**CHAPTER 4**

**TRAUMA TREATMENT PROTOCOLS**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 90 of 304
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<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 91 of 304</p>
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## **MULTIPLE TRAUMA OVERVIEW**

### **Specific information needed**

- A. Mechanism of injury
  - 1. Cause, precipitating factors, weapons.
  - 2. Trajectories and forces involved to patient.
  - 3. Vehicular trauma – condition of vehicle, windshield, steering wheel, use of seatbelts.
  - 4. Helmet use if motorcycle or bicycle.
- B. Patient complaints.
- C. Initial position and level of consciousness of patient from witnesses, first responders.
- D. Patient movement, treatment since injury.
- E. Other factors such as drugs, medications, diseases.

### **Specific objective findings**

- A. Scene evaluation
  - 1. Note potential hazard to rescuers and patient.
  - 2. Identify number of patients. Organize triage if appropriate.
  - 3. Observe position of patient, surroundings, probable mechanism, and vehicle condition.
- B. Patient evaluation – initial assessment in a multiple trauma patients is performed at the same time as treatment.

### **Initial assessment and treatment**

- A. Evaluate scene. Make area safe for rescuers and patient; call for back-up as needed.
- B. Airway
  - 1. Open airway using jaw thrust maneuver, keeping neck in neutral alignment.
  - 2. Use assistant to provide cervical stabilization while managing ABCs.
  - 3. Clear the airway using finger sweep, suction as needed.
  - 4. Use towel clip or hand to draw tongue and mandible forward if needed in patients with facial injuries.
- C. Breathing
  - 1. Treat respiratory arrest with
    - a. Bag-valve-mask for initial ventilatory control.
    - b. CPR as needed.
    - c. Intubate (prefer orotracheal) with cervical stabilization after initial ventilation as above. Confirm position of the tube, ventilate and monitor during transport.
    - d. If difficulty with intubation, consider Dual-lumen airway.
    - e. If none of the above are effective due to severe facial injury or other factors, perform cricothyrotomy. Confirm position of the tube, ventilate and monitor.
  - 2. Look for signs of partial obstruction – noisy breathing, exaggerated chest wall movements. If present
    - a. Suction and clear manually.
    - b. Reposition jaw while protecting neck.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 92 of 304</p>
---	-------------------------------	--

- c. Insert oral or nasal airway as needed.
  3. If respiratory rate < 12/minute, > 20/minute or breathing appears inadequate
    - a. Apply O<sub>2</sub>, support with bag-valve-mask.
    - b. Consider intubation – nasotracheal or orotracheal with firm cervical stabilization to secure airway.
      - c. Confirm position of the tube, ventilate and monitor.
      - d. If difficulty with intubation, consider RSI or dual-lumen airway.
  4. Inspect chest for symmetrical rise, sucking wounds, flail segment. If indicated
    - a. Stabilize flail and cover sucking wounds. (See Chest Injury Protocol.)
    - b. If ventilations, which were initially effortless, become difficult after bagging, consider tension pneumothorax decompression.
    - c. Apply O<sub>2</sub>, moderate flow (4-6 L/min), by mask or nasal cannula (high flow with mask for critical patients). Titrate to pulse oximetry > 90% if possible.
- D. Circulation
1. Control hemorrhage with direct pressure, and tourniquet as needed.
  2. Check radial pulse – presence implies BP > 80 mm Hg systolic. If not present, check carotid or femoral pulse (presence implies BP > 60-70 mm Hg systolic).
  3. Check pulse for quality (strong, weak), general rate (slow, fast, moderate).
  4. Check skin color, temperature, and capillary refill.
  5. Initiate CPR and transport if no pulses are present, but initial vital signs detected, unless multiple casualty scene or prolonged transport make resuscitation impossible.
- E. Disability
1. Check level of consciousness, briefly, for essential elements – AVPU.  
 A – Alert  
 V – Responds to Verbal stimuli  
 P – Responds to Painful stimuli  
 U – Unconscious
  2. Check pupils – round? reactive? equal?
- F. Obtain vital signs if patient stable or adequately resuscitated.
- G. Immobilize cervical spine when appropriate (relieve assistant performing manual stabilization).
- H. Transfer patient to board.
- I. EXTRICATE AND TRANSPORT RAPIDLY if patient has multiple injuries or abnormal respiratory, circulatory or neurologic status.
- J. Treat hypovolemic shock enroute
1. Elevate legs, keep patient warm.
  2. IV – volume expander (NS or RL), large bore, two sites
    - a. TKO if patient appears stable and systolic BP > 90.
    - b. Wide open if significant signs of shock, 20 ml/kg.
  3. Stabilize and splint fractures.
  4. Dress wounds if time allows.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 93 of 304
---	-----------------------	-------------------------------

- K. If patient stable
  - 1. Perform secondary survey and full neurologic exam. Record list of patient's problems.
  - 2. With significant injury or potential for hypovolemia, start IV – volume expander (NS or RL), large bore, one or two sites, TKO.
  - 3. Stabilize and splint fractures.
  - 4. Dress wounds if possible.
  - 5. Reassess and treat patient for life-threats
    - a. Adequacy of airway, breathing.
    - b. Emergent chest injuries
      - 1. Flail section.
      - 2. Tension pneumothorax.
      - 3. Cardiac tamponade.
      - 4. Sucking chest wound.
    - c. Monitor closely for signs of hypovolemia.
- L. Recheck vital signs, neurologic status, and monitor cardiac rhythm enroute.

### **Specific precautions**

- A. Although the organization of assessment and management may seem complex, remember the basic principles to keep organized.
  - 1. As with any critical patient, assess and manage life-threatening impairment of
    - a. Airway
    - b. Breathing
    - c. Circulation
  - 2. If patient unstable, transport urgently (LOAD AND GO).
  - 3. If the patient is stable, assess for potentially life-threatening injuries (detailed exam) and manage them.
- B. Serial vital signs and observations of neurologic status in the field are critical. Use a flow chart to help organize information and observe if patient is improving or deteriorating.
- C. Direct pressure will control most external hemorrhage. Continued direct hand pressure during transport may be required. Use a commercial tourniquet as needed.
- D. Even in the noncritical patient with significant injury, "stabilization in the field" does not occur. With major injuries, the very most that can be done is to buy time. If the initial bolus of fluids resulted in improved vitals, do not become complacent. This patient frequently needs blood and an operating room to truly "stabilize" the traumatic process. Rapid transport is still of the highest priority.
- E. Recent literature has questioned the value of rapid fluid infusion for patients with ongoing internal bleeding. There is at least some evidence that internal bleeding may be increased with the administration of fluids. The final answer is not available, but it may be prudent to consider maintaining the IVs at TKO if the patient is not in profound shock. The establishment of one or two IVs will remain a priority. It is important to have the lines available should the patient deteriorate or for the rapid administration of fluids and blood in the operating room after the bleeding has been controlled. The earlier those vessels are cannulated the greater the success rate.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 94 of 304
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## **ABDOMINAL TRAUMA**

### **Specific information needed**

- A. Patient complaints.
- B. For penetrating trauma – weapon, trajectory.
- C. For auto – condition of vehicle, steering wheel, dash – air bags deployed, speed, patient trajectory, seatbelts in use (type – lap/shoulder).
- D. Past history – medical problems, medications.

### **Specific objective findings**

- A. Observe – distention, bruising, entrance/exit wounds.
- B. Palpate – areas of tenderness, guarding, pelvis stability to lateral and suprapubic compression.
- C. Condition of vehicle and steering wheel.

### **Treatment**

- A. Stabilize life-threatening airway, breathing and circulatory problems first. Obtain vital signs.
- B. IV – volume expander (NS or RL), large bore, TKO if patient stable.
- C. For penetrating injuries – cover wounds and evisceration with moist saline gauze to prevent further contamination and drying. Do not attempt to replace.
- D. Observe carefully for signs of blood loss. If BP < 90 systolic or significant signs of shock
  - 1. Second IV, large bore, volume expander, if possible.
  - 2. Administer fluid bolus, 20 ml/kg, and further fluids as directed.
- E. Monitor vital signs during transport.

### **Specific precautions**

- A. The extent of abdominal injury is difficult to assess in the field. Be very suspicious; with significant blunt trauma, injuries to multiple organs are the rule.
- B. Patients with spinal cord injury or altered sensorium due to drugs, alcohol, or head injury may not complain of tenderness and may lack guarding in the presence of significant intra-abdominal injury.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 95 of 304
---	-----------------------	-------------------------------

## **AMPUTATION**

### **Specific information needed**

- A. History – time and mechanism of amputation, care for severed part prior to rescuer arrival.
- B. Past history – medical conditions, bleeding tendencies, meds.

### **Specific objective findings**

- A. Vital signs. Other injuries. Blood loss at scene.
- B. Structural attachments in partial amputations if identifiable.

### **Treatment**

- A. Control hemorrhage with direct pressure, and tourniquet as needed.
- B. Resuscitate and treat airway, breathing, and circulatory problems.
- C. If significant hypotension: IV – volume expander (NS or RL), 20 ml/kg, then TKO or as directed.
- D. Patient – gently cover stump with sterile dressing. Saturate with sterile saline. Cover with dry dressing.
- E. Severed part – Wrap in sterile gauze. Moisten with sterile saline. Place in water-tight container in cooler with ice (do not freeze).
- F. Consult base for instruction on optimum transport destination.

### **Specific precautions**

- A. Partial amputations should be dressed and splinted in alignment with extremity to ensure optimum blood flow. Avoid torsion in handling and splinting.
- B. Do not use dry ice to preserve severed part.
- C. Control all bleeding by direct pressure only to preserve tissues. The most profuse bleeders may occur in partial amputations, where cut vessel ends cannot retract to stop bleeding. Never clamp bleeding vessels with hemostats.
- D. Many factors enter into the decision to attempt reimplantation (age, location, condition of tissues, etc). Treatment decisions cannot be made until the patient and part have been examined by the specialist – and may not be made at the primary care hospital. Try to help the family and patient understand this and do not falsely elevate hopes.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 96 of 304
---	-----------------------	-------------------------------

## CHEST INJURY

### Specific information needed

- A. Patient complaints – chest pain (type), respiratory distress, neck pain, other areas of injury.
- B. Mechanism – amount of force involved, particularly deceleration, speed of impact, seatbelt use, and type.
- C. Penetrating trauma – size of object, caliber of bullet.
- D. Past medical history – medications, medical problems.

### Specific objective findings

- A. Observe – wounds, air leaks, chest movement, neck veins.
- B. Palpate – tenderness, crepitus, tracheal position, tenderness on sternal compression, pulse pressure.
- C. Auscultate – breath sounds, heart sounds (quality).
- D. Surroundings – weapons, vehicle, steering wheel condition.

### Treatment

- A. Clear and open airway. Stabilize neck.
- B. Assist breathing if patient is apneic or respirations depressed.
- C. Apply O<sub>2</sub>, high flow (10-15 L/min) by mask. Titrate to pulse oximetry > 90% if possible.
- D. Control exsanguinating hemorrhage with direct pressure.
- E. If penetrating injury present, transport rapidly with further stabilization enroute.
- F. For open chest wound with air leak, use Vaseline-type gauze occlusive dressing, plastic wrap or aluminum foil taped on three sides only, to allow air to escape but not enter the chest.
- G. Observe chest for paradoxical movements. Treat lateral flail segment by splinting with sandbags or bags of IV fluid. Use hand pressure to sternum or other areas of the chest to minimize abnormal movement. If chest cannot be adequately stabilized by those means, consider intubation and positive pressure ventilation.
- H. IV – volume expander (NS or RL), large bore, TKO.
- I. Obtain baseline vital signs, neurologic assessment.
- J. Evaluate neck veins and blood pressure
  1. If neck veins flat and patient's BP < 90, transport rapidly and treat hypovolemia enroute
    - a. Consider fluid bolus of 20 ml/kg, further fluids as directed.
    - b. Monitor cardiac rhythm.
  2. If patient BP < 90, neck veins distended, also transport rapidly, and consider
    - a. Tension pneumothorax if respiratory status markedly deteriorating with clinical findings of pneumothorax
      1. Release dressings on open chest wounds.
      2. Consider needle decompression.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 97 of 304</p>
---	-------------------------------	--

- b. Pericardial tamponade if mechanism of injury suspicious (may have distant heart sounds and narrow pulse pressure)
      - 1. Consider fluid bolus of 20 ml/kg.
    - c. Cardiac contusion with typical ischemic chest pain or severe chest wall contusion
      - 1. Monitor cardiac rhythm.
      - 2. Consider cautious fluid bolus of 10 ml/kg enroute or as directed.
      - 3. Lidocaine, 1 mg/kg, IV for significant PVCs.
  - 3. If BP > 90
    - a. Complete detailed exam.
    - b. If significant injury present
      - 1. Second IV, volume expander (NS or RL), large bore, TKO.
      - 2. Monitor cardiac rhythm enroute.
      - 3. Lidocaine, 1 mg/kg, IV for significant PVCs.
    - c. Bandage and splint if appropriate.
- K. Immobilize impaled objects in place with dressings to prevent movement. If necessary transport sitting up or prone.
- L. Monitor vitals and level of consciousness every five minutes.

**Specific precautions**

- A. Chest trauma is treated with difficulty in the field and prolonged treatment before transport is NOT indicated. If patient is critical, transport rapidly and avoid treatment of non emergent problems at the scene. Penetrating injury particularly should receive immediate transport with minimal intervention in the field.
- B. Consider medical causes of respiratory distress such as asthma, pulmonary edema or COPD that have either caused trauma or been aggravated by it. Consider MI in single car crash.
- C. Chest injuries sufficient to cause respiratory distress are commonly associated with significant blood loss. Look for hypovolemia.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 98 of 304
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## **EXTREMITY INJURIES**

### **Specific information needed**

- A. Mechanism of injury, direction of forces, if known.
- B. Areas of pain or limited movement.
- C. Treatment prior to arrival – reduction of open or closed fracture, movement of patient.
- D. Past medical history – medications, medical illnesses.

### **Specific objective findings**

- A. Vital signs.
- B. Observe – localized swelling, discoloration, angulation, lacerations, exposed bone fragments, loss of function, guarding.
- C. Palpate – tenderness, crepitus, instability, quality of distal pulses, sensation.
- D. Note estimated blood loss at scene.

### **Treatment**

- A. Treat airway, breathing, and circulation as first priorities.
- B. Immobilize cervical spine when appropriate.
- C. Examine for additional injuries to head, face, chest, and abdomen. Treat problems with higher priority first.
- D. If patient unstable, transport rapidly, treating life-threatening problems enroute. Splint patient by securing to long board to minimize fracture movement.
- E. If patient stable, or isolated extremity injury exists
  - 1. Check distal pulses and sensation prior to immobilization of injured extremity.
  - 2. Apply sterile dressing to open fractures. Note carefully wounds that appear to communicate with bone, and initial position of bone in wound.
  - 3. Splint areas of tenderness or deformity – apply gentle traction throughout treatment and try to immobilize the joint above and below the injury in the splint.
  - 4. Reduce fractures (including open fractures) by applying gentle axial traction if indicated
    - a. To restore circulation distally.
    - b. To immobilize adequately.
  - 5. Check distal pulses and sensation after reduction and splinting.
  - 6. Elevate simple extremity injuries. Apply padded ice if time and extent of injuries allow.
  - 7. Monitor circulation (pulse and skin temperature), sensation, and motor function distal to the site of injury during transport.
  - 8. Consider pelvic wrap/sling for stabilization of pelvic fractures.
  - 9. Provide pain control for pain unresponsive to splinting or to assist with splint.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 99 of 304
---	-----------------------	-------------------------------

### **Special precautions**

- A. Patients with multiple injuries have a limited capacity to recognize areas which have been injured. A patient with a femur fracture may be unable to recognize that he has other areas of pain. Be particularly aware of injuries proximal to the obvious ones (e.g., a hip dislocation with a femur fracture, or a humerus fracture with a forearm fracture).
- B. Do not use ice or cold packs directly on skin or under air splints, pad with towels or leave cooling for hospital setting.
- C. Do not attempt to reduce dislocations in the field. The only reasonable exception is a dislocated patella – if the diagnosis is clear and transport time is greater than 5 minutes – reduce dislocation by gently straightening the leg (after pain medication, if possible). Splint all dislocations in the position of comfort.
- D. Fractures do not necessarily lead to loss of function. Impacted fractures may cause pain but little or no loss of function.
- E. Do not allow severely angulated, open, bloody fractures to distract you from a less obvious pneumothorax with respiratory distress. Extremity injuries benefit from appropriate care, but are of low priority in a multiple-injured patient. Quick stabilization with a long board and generous taping is ample for the seriously injured patient.
- F. Fractures near joints may become more painful and circulation may be lost with attempted reduction. If this occurs, stabilize the limb in the position of most comfort and with the best distal circulation.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 100 of 304
---	-----------------------	--------------------------------

## FACE AND NECK TRAUMA

### Specific information needed

- A. Mechanism of injury – impact of steering wheel, windshield, or other objects. Clothesline-type injury to face or neck.
- B. Management before arrival by bystanders, first responders.
- C. Patient complaints – areas of pain, trouble with vision, hearing, neck pain, abnormal bite.
- D. Past medical history – medications, medical illnesses.

### Specific objective findings

- A. Vital signs.
- B. Airway – jaw or tongue instability, loose teeth, vomitus or blood in airway, other evidence of impairment or obstruction.
- C. Neck – tenderness, crepitus, hoarseness, bruising, and swelling.
- D. Blood or drainage from ears, nose.
- E. Level of consciousness, evidence of head trauma.
- F. Injury to eyes, lid laceration, blood anterior to pupil, abnormal pupil, abnormal globe position or softness.

### Treatment

- A. Control airway
  - 1. Open airway using jaw thrust, keeping neck in alignment with manual stabilization.
  - 2. Use finger sweep to remove teeth or debris.
  - 3. Suction blood and other debris, as able.
  - 4. Stabilize tongue and mandible with chin lift, manual traction or towel clip to tongue to keep posterior pharynx open as needed.
  - 5. Note evidence of laryngeal injury and transport immediately if signs present.
  - 6. With isolated facial injury, place patient prone or sitting up and leaning forward to ensure airway as needed.
  - 7. Intubate if bleeding severe or airway cannot be maintained otherwise. Avoid nasotracheal intubation with mid-face trauma. If using orotracheal approach, ensure cervical stabilization to prevent neck extension. Confirm tube position immediately after intubation.
  - 8. If intubation cannot be performed due to severe facial injury, attempt to manage with suctioning and supportive care. Consider RSI or alternative airways.
  - 9. If necessary, consider cricothyrotomy. Confirm tube position immediately after procedure.
- B. Support breathing as needed. If mask fit cannot be maintained because of trauma, consider intubation or cricothyrotomy.
- C. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90%.
- D. Stop hemorrhage. Check pulse and circulation.
- E. IV – volume expander (NS or RL), large bore
  - 1. TKO if stable.
  - 2. With signs of shock, administer 20 ml/kg fluid bolus, further fluids as directed.
- F. Immobilize cervical spine (relieve assistant performing cervical stabilization).

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 101 of 304
---	-----------------------	--------------------------------

- G. Obtain vital signs, assess neurologic status.
- H. Complete secondary survey if no life-threatening injuries present.
- I. Cover injured eyes with protective shield or cup – avoid pressure or direct contact to eye.
- J. Do not attempt to stop free drainage from ears, nose. Cover lightly with dressing to avoid contamination.
- K. Transport avulsed teeth with the patient. Keep moist in saline-soaked gauze.
- L. If airway secured and patient stable, splint fractures and manage non-emergent injuries at scene or enroute.
- M. Monitor airway closely during transport for development of obstruction or respiratory distress. Suction and treat as needed.

### **Specific precautions**

- A. Fracture of the larynx should be suspected in patients with respiratory distress, abnormal voice, and history of direct blow to neck from steering wheel, rope, fence, wire, etc. Both intubation and needle cricothyrotomy may be unsuccessful in the patient with a fractured larynx and attempts may precipitate respiratory arrest. Transport rapidly for definitive treatment, if you suspect this potentially lethal injury. Do not attempt intubation or cricothyrotomy unless the patient arrests.
- B. Airway obstruction is the primary cause of death in persons sustaining head and face trauma. Meticulous attention to suctioning, and stabilization of tongue and mandible may be the most important treatment rendered.
- C. Do not be concerned with contact lens removal in the field. The safest place for lenses is in the eye.
- D. In penetrating neck trauma, avoid intubation unless absolutely essential.

## HEAD TRAUMA

### Specific information needed

- A. History – mechanism of injury, estimate of force involved, helmet worn with motorcycle or bicycle.
- B. History since injury – loss of consciousness (duration), change in level of consciousness, memory loss for events before and after trauma, movement (spontaneous or performed by bystanders).
- C. Past history – medications (insulin particularly), medical problems, seizure history.

### Specific objective findings

- A. Vital signs (note respiratory pattern and rate).
- B. Neurologic assessment, including pupils, response to stimuli and Glasgow Coma Scale observations.

	Adult	Revised Pediatric	
Eye Opening	None	None	1
	To pain	To pain	2
	To Speech	To Speech	3
	Spontaneously	Spontaneously	4
Best Verbal Response	None	None	1
	Garbled sounds	Inconsolable, agitated	2
	Inappropriate words	Inconsistently inconsolable, moaning	3
	Disoriented sentences	Cries but consolable, inappropriate interactions	4
	Oriented	Smiles, orientated to sounds, follows objects, interacts	5
Best motor response	None	None	1
	Abnormal extension	Decerebrate Posturing	2
	Abnormal flexion	Decorticate Posturing	3
	Withdrawal to pain	Withdrawal to pain	4
	Localizes pain	Withdraws from touch	5
	Obeys commands	Moves spontaneously or purposefully	6

GLASGOW COMA SCORE = Sum of scores in 3 categories(15 points possible)

- C. External evidence of trauma – contusions, abrasions, lacerations, bleeding from nose, ears.

### Treatment

- A. Assess airway and breathing. Treat life-threatening difficulties (see Trauma Overview). Use assistant to provide cervical stabilization while managing respiratory difficulty.
- B. Control hemorrhage. Stop scalp bleeding with direct pressure if possible. Continued pressure may be needed.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 103 of 304
---	-----------------------	--------------------------------

- C. Apply O2, moderate flow (4-6 L/min), by mask or nasal cannula (high flow by mask for seriously injured patients). Titrate to pulse oximetry > 90% if possible.
- D. Obtain initial vital signs, neurologic assessment, including Glasgow Coma Score.
- E. If unconscious, or Glasgow Coma Score < 11
  - 1. Assist ventilations.
  - 2. Consider intubation. If time allows administer lidocaine, 1.5 mg/kg IV, 1 minute prior to intubation.
  - 3. Ventilate at 12 - 16 breaths per minute. If capnography is available, ventilate to maintain end tidal CO2 of 32-38.
  - 4. Consider RSI.
- F. Immobilize cervical spine (relieve assistant performing manual stabilization).
- G. Immobilize patient on spine board.
- H. Secure patient to board following transfer. Be prepared to tilt for vomiting.
- I. TRANSPORT RAPIDLY if patient has multiple injuries, or unstable respiratory, circulatory, or neurologic status.
- J. If signs of hypovolemic shock are present, initiate treatment enroute.
  - 1. Elevate legs, keep patient warm.
  - 2. IV – volume expander (NS or RL), large bore to maintain systolic blood pressure >120 in an attempt to maintain cerebral pressure.
  - 3. Consider bleeding sources (abdomen, pelvis, and chest).
  - 4. Stabilize and splint fractures, dress wounds if time allows.
- K. If patient unconscious and showing signs of neurological deterioration (e.g., dilated pupil, rising BP, slowing pulse, posturing or decreasing GCS)
  - 1. Hyperventilate at 20-24 breaths per minute. If capnography is available, ventilate to maintain end tidal CO2 of 30-35.
  - 2. Consider furosemide, 20-40 mg IV.
- L. If patient stable (respiratory, circulatory, neurologically)
  - 1. IV – volume expander (NS or RL), large bore, TKO.
  - 2. Complete secondary survey.
  - 3. Splint fractures and dress wounds if time permits.
- M. Monitor airway, vitals, and level of consciousness repeatedly at scene and during transport. STATUS CHANGES ARE IMPORTANT.

### **Specific precautions**

- A. When head injury patients deteriorate, check first for airway, oxygenation and blood pressure. These are the most common causes of "neurologic" deterioration. If the patient has tachycardia or hypotension, look for hidden hypovolemia from associated injuries and do not blame the head injury.
- B. The most important information you provide for the base physician is level of consciousness and its changes. Is the patient stable, deteriorating or improving?
- C. Assume cervical spine injury in all patients with head trauma.
- D. Restlessness can be a sign of hypoxia. Cerebral anoxia is the most frequent cause of death in head injury.
- E. If active airway ventilation is needed, intubate and hyperventilate at 20-24/minute. If capnography is available ventilate to maintain end tidal CO2 of 30-35. **Hypoventilation and excessive hyperventilation both compromise cerebral perfusion**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 104 of 304
---	-----------------------	--------------------------------

- F. If patient is combative from head injury or hypoxia, consider use of morphine sulfate 2-4 mg IV or fentanyl 0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order). Repeat as needed to reduce combativeness. Additionally, diazepam can be utilized to decrease combative state. The airway and C-spine can be more appropriately managed with a relaxed patient and the effects can be reversed at the receiving facility if desired. Administer cautiously (SLOWLY) in hypovolemic patient.
- G. Do not try to stop bleeding from nose and ears. Cover with clean gauze if needed to prevent further contamination.
- H. Scalp lacerations can cause profuse bleeding, and are difficult to define and control in the field. If direct local pressure is insufficient to control bleeding, evacuate any large clots from flaps and large lacerations with sterile gauze and use direct hand pressure to provide hemostasis. If the underlying skull is unstable, pressure should be applied to the periphery of the laceration over intact bone.
- I. Control seizure activity with benzodiazepine per protocol.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 105 of 304
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## **SHOCK: TRAUMATIC**

### **Specific information needed**

- A. Mechanism of injury – position, forces, speed, trajectory.
- B. Patient complaints – thirst, dizziness, weakness, chest pain, trouble breathing.
- C. Car – steering wheel and vehicle condition, seatbelt use and type.
- D. Past medical history – medications, medical illnesses.

### **Specific objective findings**

- A. Vital signs – pulse > 120 (bradycardia or normal pulse rate may occur in some patients), BP < 90 systolic.
- B. Mental status – mania or apathy, confusion, restlessness.
- C. Skin – flushed, constricted, sweaty, cool or warm, color.
- D. Signs of blunt injury or bleeding – flank hematoma, chest or abdominal wall contusion.
- E. Jugular veins – flat or distended.

### **Treatment**

- A. Assess airway and breathing, treat life-threatening difficulties (see Trauma Overview). Use assistant to provide cervical stabilization while managing ABCs.
- B. Control hemorrhage by direct pressure with clean dressing to wound. If needed, add tourniquet or hemostatic agents per protocol
- C. Obtain initial vital signs, neurologic assessment, including Glasgow Coma Score.
- D. Immobilize cervical spine as appropriate, (relieve assistant performing cervical stabilization).
- E. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
- F. Transfer patient to board.
- G. IV – volume expander (NS or RL), large bore, TKO.
- H. If BP < 90 systolic and neck veins flat, transport rapidly and treat shock enroute
  - 1. Keep patient warm with blankets to prevent heat loss.
  - 2. Raise legs 10-12 inches.
  - 3. Consider fluid bolus of 20 ml/kg, or as directed.
  - 4. Monitor cardiac rhythm.
  - 5. Look carefully for possible sources of bleeding (abdomen, pelvis, chest, scalp, back).
- I. If BP < 90 systolic and signs of cardiogenic shock (distended neck veins), transport rapidly and consider
  - 1. Tension pneumothorax if respiratory status markedly deteriorating, with clinical findings of pneumothorax
    - a. Release occlusive dressings on open chest wounds.
    - b. Consider needle decompression.
  - 2. Pericardial tamponade if wound suspect (may have distant heart sounds, narrow pulse pressure)
    - a. Consider fluid bolus of 20 ml/kg.
  - 3. Cardiac contusion with typical ischemic chest pain or severe chest wall contusion
    - a. Monitor cardiac rhythm.
    - b. Consider cautious fluid bolus of 10 ml/kg enroute or as directed.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 106 of 304</p>
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- c. Lidocaine, 1 mg/kg IV for significant PVCs.
- J. If BP > 90, observe closely and transport.
  - 1. Perform secondary survey and record patient's problems.
  - 2. Maintain IV at TKO rate.
  - 3. Stabilize and splint fractures.
  - 4. Dress wounds as time allows.
- K. Recheck vital signs and neurologic status enroute – at least every 5 minutes with unstable patient.

**Specific precautions**

- A. Hypotension itself is a late sign of hypovolemic shock. Blood loss must be anticipated from the mechanism of injury. Often a patient may suddenly "go bad" if the subtle clues aren't noticed beforehand.
- B. Hypertensive and elderly patients can have significant hypotension at pressures higher than 90 systolic. Look for the adrenergic signs – vasoconstriction, sweating, mental alterations, and agitation. Treat the entire picture and not just the blood pressure.
- C. Neurogenic shock is caused by relative hypovolemia as blood vessels lose tone from spinal cord injury. Treat as for hypovolemia, and if hypotension persists, consider occult blood loss as an additional cause of shock.
- D. Occasionally, pain or cardiac contusion will cause inappropriate bradycardia. Consider also if an MI or a primary dysrhythmia may have caused the trauma. Fluid resuscitation should be cautious. Pain medication may also normalize the pulse if there are no contraindications.
- E. Another important and frequent cause of "relative" bradycardia (pulse < 100) in the face of hypovolemic shock is the patient on beta-blocker drugs (e.g., propranolol), who cannot respond to blood loss with a tachycardia. Patients with angina, prior MI, migraine, hypertension, dysrhythmias and other medical illnesses may be taking beta-blockers. Treatment is the same, but do not wait for the tachycardia!
- F. Recent literature has thrown some doubt on the wisdom of administering a large fluid bolus to all trauma patients who present in shock. Particularly in the face of ongoing internal hemorrhage, patients may do better with IVs at TKO until the bleeding can be stopped in the OR.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 107 of 304
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## SPINAL TRAUMA

### Specific information needed

- A. Mechanism of injury and forces involved. Be suspicious with falls, airplane crashes, decelerations, diving accidents.
- B. Past medical history and medications.

### Specific objective findings

- A. Vital signs, including neurologic assessment.
- B. Level of sensory deficit. Presence of any evidence of neurologic function below level of injury. Priapism.
- C. Physical exam with careful attention to organs or limbs which may not have sensation.

### Treatment

- A. Assess airway and breathing. Treat life-threatening difficulties. Use controlled ventilation for high cervical cord injury associated with abdominal breathing. Use assistant to provide cervical stabilization while managing ABCs.
- B. Control hemorrhage. Stop scalp bleeding with direct pressure if possible. Continued manual pressure may be needed.
- C. Apply O<sub>2</sub>, Titrate to pulse oximetry > 90% if possible.
- D. Obtain initial vital signs, neurologic assessment, including Glasgow Coma Score.
- E. Immobilize cervical spine with firm cervical collar. Maintain stabilization manually until securely immobilized on spine board.
- F. Immobilize thoracic and lumbosacral spine with spine board. Move patient as little as possible and always move as a unit.
- G. Secure patient to board following transfer. Secure trunk first, then cervical spine, then extremities.
- H. IV – volume expander (NS or RL), large bore, TKO.
- I. If patient BP < 90 mm systolic and signs of hypovolemic shock
  - 1. Keep patient warm with blankets to prevent heat loss.
  - 2. Raise legs (or foot of spine board) 10-12 inches.
  - 3. Examine for possible sources of bleeding (abdomen, pelvis, chest, scalp, back).
  - 4. Administer fluid bolus of 20 ml/kg or as directed.
  - 5. Consider Dopamine in shock unresponsive to fluids and thought to be neurogenic in nature.
- J. Mark level of sensory deficit gently with pen on patient's skin to facilitate monitoring.
- K. Monitor airway, vitals, and neurologic status frequently at scene and during transport.

### Specific precautions

- A. Be prepared to tip entire board on side if patient vomits (patient must be secured to spine board or scoop stretcher –wide tape or straps anchored to both sides of board preferred).
- B. Neurogenic shock is likely with significant spinal cord injury. Raise the foot of the spine board or legs only, whichever is easier logistically. Be sure respirations remain adequate.
- C. If hypotension is unresponsive to simple measures, it is likely due to other injuries. Neurologic deficits make these other injuries hard to evaluate. Cord injury above the level of T-8 removes tenderness, rigidity, and guarding as clues to abdominal injury.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 108 of 304
---	-----------------------	--------------------------------

- D. The patient with spinal trauma and normal neurologic function or only a partial deficit should not be treated more casually than the patient with a complete deficit. This is the patient who can benefit most from your conscientious splinting efforts and protection from further injury.
- E. Spinal immobilization for patients with primarily penetrating trauma is rarely necessary. Consider immobilization when there is an apparent neurological deficit, an impaled foreign body, or other indication of specific cord damage.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 109 of 304</p>
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## **SPECIAL TRAUMA PROBLEMS**

Certain trauma situations call for assessment and treatment that goes beyond the standard treatment given for the patient's presenting complaints and injury. Treatment of physical injuries should be as listed in the protocols, but the following special considerations should be noted

### **SEXUAL ASSAULT**

- A. History should not be more extensive than necessary from a medical standpoint. Legal and psychological details are best left to persons who will be able to use that information, follow it up with appropriate actions, and provide ongoing support to the patient.
- B. You can, however, help with the patient's psychological needs. Do not judge the victim, who already feels debased, worthless, and guilty, no matter how blameless. Allow the patient as much freedom of choice in dealing with the medical community as possible. Do as little controlling as possible - let the patient control any aspects of care that he or she can. ("We need to start an IV. Would you like that in your left arm or your right?")
- C. Remember that the radio waves are public. Particularly with sexual assault victims, refrain from names and details.
- D. There may be hesitancy on the part of the victim to accept assistance from the same sex as the assailant. If an attendant of the other sex is available, it may be preferable to allow that attendant to treat. Be aware, however, that this can be a chance to revive faith in the other sex. Allow the patient to choose how interactive he or she would like to be.
- E. You should encourage the victim to leave the same clothes on and not to bathe before coming to the hospital. This goes against a victim's instincts at the time but will help preserve legal evidence.
- F. Encourage the victim to seek treatment even if reluctant to call the police and initiate legal action. There is still important medical treatment that can be offered, and the hospital staff or crisis counselor may allow the patient a better understanding of legal choices.

### **CHILD ABUSE/NEGLECT**

- A. Observe child for evidence of other injury, healing old wounds, multiple bruises. Also note how child relates to adults, physical and emotional relations within family unit.
- B. Although some injuries, such as cigarette burns, are characteristic of child abuse, most abuse injuries are similar to many other injuries.  
Suspicious scenarios include
  - 1. Injured child without obvious mechanism. Injuries which do not match story or stories which are inappropriate to the child's age.
  - 2. Delay in seeking treatment.
  - 3. Blame on third party.
  - 4. Multiple different stories.
  - 5. History of multiple previous episodes of trauma.
- C. Don't accuse or judge. Observe, and share your observations with appropriate authorities. This is an instance where your skilled powers of observation in the field, and your ability to be discreet and to keep an open mind are most needed.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 110 of 304</p>
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- D. If abuse is suspected, transport the child, even if the injuries themselves do not warrant it. The same child may even be admitted for minor injuries to provide sufficient time to assess the situation and prevent serious injury or death in the future.

### **PREGNANT TRAUMA PATIENT**

- A. AVOID SUPINE POSITIONING in obviously pregnant patient. Pressure from the uterus on the inferior vena cava prevents venous return to the heart, and can result in severe hypotension. Turn patient to side (preferably left) or use your hands to hold uterus off central abdominal vessels.
- B. Blunt abdominal trauma is difficult to evaluate because the abdominal exam is unreliable. Deceleration forces can cause placental separation. Seatbelts should be worn, but lap belts should be low, next to the pelvis, and fit snugly (more injuries still occur due to lack of seatbelt than are caused by them). All obviously pregnant patients should be transported for close evaluation and observation.
- C. Think of eclampsia as a possible cause of injury in the pregnant trauma victim with altered mental state, seizures, or hypertension.
- D. The fetus is much more sensitive to hypoxia and hypovolemia than the mother. For this reason, O<sub>2</sub> should always be applied and treatment for blood loss should begin before hypotension becomes evident.

### **TRAUMA ARREST**

- A. Blunt trauma arrest – Confirm no respirations, no pulse. If there appears to be any chance of resuscitation (report of recent respiration, pulse, or movement, no apparent injury that would be incompatible with life)
1. Open airway, ventilate with bag-valve-mask.
  2. Intubate to secure airway.
  3. Needle decompression of chest if suspected tension pneumothorax.
  4. Contact base to consider terminating efforts if no response and transport time significant.
- B. Penetrating trauma arrest – Confirm no respirations, no pulse. If there appears to be any chance of resuscitation
1. Open airway, ventilate with bag-valve-mask.
  2. Intubate to secure airway.
  3. Needle decompression of chest if suspected tension pneumothorax.
  4. IV – volume expander (NS or RL), wide open to 20 ml/kg.
  5. Contact base to consider terminating efforts if no response and longer than 10 minute transport to definitive care.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 111 of 304
---	-----------------------	--------------------------------

**CHAPTER 5**

**ENVIRONMENTAL TREATMENT  
PROTOCOLS**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 112 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 113 of 304
---	-----------------------	--------------------------------

## **BITES AND STINGS**

### **Specific information needed**

- A. Type of animal. Time of exposure.
- B. Symptoms
  - 1. Local – pain, stinging.
  - 2. Generalized –nausea, weakness, itching, trouble breathing, dizziness, muscle cramps.
  - 3. History of previous exposures, allergic reactions.

### **Specific objective findings**

- A. Identification of spider, bee, marine animal if possible.
- B. Local signs – erythema, swelling, heat in area of bite.
- C. Systemic signs – hives, wheezing, respiratory distress, abnormal vital signs.

### **Treatment**

SNAKES      See Snake Bites

#### SPIDERS AND SCORPIONS

- A. Ice for comfort.
- B. Bring in spider if captured or if dead for accurate identification.
- C. Transport for observation if systemic signs and symptoms present.

#### BEEES AND WASPS

- A. Remove sting mechanism. Try not to squeeze venom sac if this remains on stinger.
- B. For at-home first aid – a paste of water and meat tenderizer (containing papain) can be applied for local symptomatic relief.
- C. Observe patient for signs of systemic allergic reaction. Transport rapidly if needed. Treat anaphylaxis per protocol.
- D. If patient has allergy kit, consider administration to patient as appropriate.
- E. Transport all patients with systemic symptoms or history of systemic symptoms from prior bites.

#### MARINE ANIMALS

- A. Remove victim from water.
- B. Treat airway, breathing, or other problems from water aspiration.
- C. Assess and treat allergic reactions per protocol.
- D. To prevent further contamination
  - 1. Remove any stingers that can be easily lifted off (surgical removal is sometimes necessary).
  - 2. Remove nematocysts (from jellyfish, etc.) without squeezing or discharging.
    - a. Wash with sea water (not fresh water).
    - b. Pour alcohol (or vinegar) over area. Continue until pain relieved. May take 15-30 minutes.
    - c. Dust cysts with flour, baking soda, talcum powder, or shaving cream, then gently scrape off remaining cysts.
- E. For fish bites or stings, apply very warm water to skin for 15-30 minutes until pain relieved.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 114 of 304
---	-----------------------	--------------------------------

- F. IV, volume expander (NS or RL), TKO if severe contamination has occurred. Administer morphine sulfate, 2-4 mg IV, repeat as needed to total of 0.2 mg/kg for pain relief. Consider fentanyl 0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order)
- G. Transport patients with severe symptoms of envenomation or history of generalized allergic reaction.

### **Specific precautions**

- A. For all types of bites and stings, the goal of prehospital care is to prevent further inoculation and to treat allergic reactions.

Allergy kits consist of injectable epinephrine and oral antihistamine, and are prescribed for persons with known systemic allergic reactions. Prehospital care personnel still need to transport, even if assisting the patient with their own medication.

About 60% of patients who have experienced a generalized reaction to a bite or sting in the past will have a similar or more severe reaction upon reinoculation. Thus, although it is not inevitable, this group of patients must be considered at high risk for anaphylaxis. In addition, a small group of patients will have anaphylaxis as a "first" reaction.

Time since envenomation is important. Anaphylaxis rarely develops more than 60 minutes after inoculation.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 115 of 304
---	-----------------------	--------------------------------

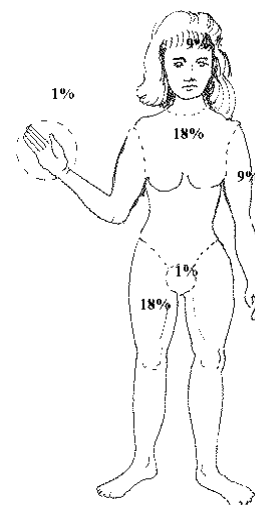
## BURNS

### Specific information needed

- A. History of injury – time elapsed since burn. Was patient in a closed space with steam or smoke? Electrical contact? Loss of consciousness? Accompanying explosion, falls, toxic fumes?
- B. Past history – prior cardiac or pulmonary disease, medications?

### Specific objective findings

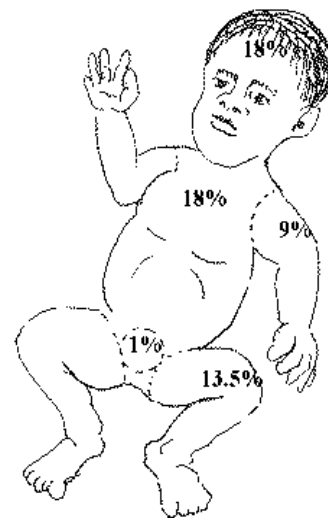
- A. Vital signs.
- B. Extent of burns – description or diagram of areas involved (during long transports only). Have diagrams ready to draw on.
- C. Depth of burns –  
Superficial - erythema only  
Significant - blistered or charred areas.
- D. Evidence of CO poisoning or other toxic inhalation – altered mental state, headache, vomiting, seizure, coma.
- E. Evidence of inhalation burns – respiratory distress, cough, hoarseness, singed nasal or facial hair, soot or erythema of mouth.
- F. Entrance and exit wounds for electrical burns.
- G. Associated trauma.



### Treatment

#### THERMAL BURN

- A. Remove clothing which is smoldering or which is non-adherent to the patient.
- B. O<sub>2</sub>, high flow (10-15 L/min), mask with non-rebreathing bag, if indications of respiratory burns, toxic inhalation, or significant smoke exposure. Titrate to pulse oximetry > 90% if possible.
- C. Assess and treat for associated trauma (blast or fall).
- D. Remove rings, bracelets, and other constricting items.
- E. If significant burn is moderate-to-severe (over 15% of body surface area), cover wounds with dry clean dressings – use wet dressings only if skin still smoldering.
- F. Use cool, wet dressings in smaller burns (less than 15%), for patient comfort.
- G. If more than 30% significant burn and transport time > 30 minutes, contact base to consider
  - 1. Optimum destination hospital.
  - 2. IV – volume expander (NS or RL), TKO or by amount of burn. Contact base for rate.



<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 116 of 304
---	-----------------------	--------------------------------

3. Fentanyl 0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order) or Morphine sulfate, 2-4 mg, for pain relief. May repeat x 1.
4. Transport, monitoring vital signs.

#### INHALATION INJURY

- A. O<sub>2</sub>, high flow (10-15 L/min), using mask with non-rebreathing reservoir bag during full time of transport. Pulse oximetry may not be accurate with inhalation injuries – CO will give a falsely high pulse oximeter reading in spite of severe functional hypoxia.
- B. Monitor CO if appropriate.
- C. Be prepared to ventilate or assist if respirations inadequate.
- D. Consider need for early intubation.
- E. Monitor cardiac rhythm.

#### CHEMICAL BURNS

- A. NOTIFY HAZ-MAT Unit as soon as any chemical contamination is recognized. Protect rescuer from contamination. Wear appropriate gloves and clothing.
- B. Remove all clothing and any solid chemical which might provide continuing contamination.
- C. Assess and treat for associated injuries.
- D. Decontaminate patient using running water for 15-20 minutes on scene, and continue as able during transport.
- E. Check eyes for exposure and rinse with free-flowing water for 15-20 minutes on scene, and continue as able during transport.
- F. Evaluate for systemic symptoms which might be caused by chemical contamination. Contact base hospital if questions.
- G. Remove rings, bracelets, constricting bands.
- H. Wrap burned area in clean, dry cloths for transport. Keep patient as warm as possible after decontamination.
- I. Consult base or Poison Control Center (PCC) for special treatment or procedures as needed.

#### ELECTRICAL INJURY

- A. Protect rescuers from continued live electric wires.
- B. Separate victim from electrical source only when area safe for rescuers.
- C. Initiate CPR as needed. Defibrillation (per Cardiac Arrest protocol), prolonged respiratory support may be needed.
- D. Immobilize cervical spine, assess for other injuries.
- E. Monitor patient for possible dysrhythmias. Treat as per dysrhythmia protocol.
- F. IV – volume expander (NS or RL), TKO or as directed.

#### **Specific precautions**

- A. Leave blisters intact when possible.
- B. Suspect airway burns in any facial burns or burns received in closed places. Edema may become severe, consider early intubation. Humidified O<sub>2</sub> is useful if available.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 117 of 304
---	-----------------------	--------------------------------

- C. Death in the first 24 hours after burn injury is due to airway burns, fluid loss, or toxic inhalants (carbon monoxide or cyanide). Fluids are calculated on the basis of extent of significant burns, (i.e., those in which there is skin blistering or disruption).
- D. Assume carbon monoxide poisoning in all closed space burns. Treatment is 100% O<sub>2</sub> continued for several hours, or hyperbaric oxygenation. In addition, other toxic products of combustion are more commonly encountered than realized. Many of these products will also give false pulse oximetry readings.
- E. Consider MI as a cause of injury in firefighters who are burned. Consider suicide attempt as cause of burn, and child abuse in pediatric burns.
- F. Lightning injuries can cause prolonged respiratory arrest. Prompt, continuous respiratory assistance (sometimes for hours to days) can result in full recovery.
- G. Field decontamination of chemical exposures has been shown to significantly reduce extent of burn. It is rare to encounter a chemical which is not properly decontaminated by copious water.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 118 of 304
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## DECOMPRESSION/DIVING INJURY

### Specific information needed

- A. Symptoms
  - 1. Chest – pain, trouble breathing, cough.
  - 2. Joints – pain, cramps.
  - 3. CNS – headache, dizziness, fatigue.
- B. Setting
  - 1. Underwater diving.
  - 2. Depressurization or inadequate pressurization at high altitudes.
  - 3. Air tank failure during dive.
  - 4. High altitude exposure (such as flying) after scuba diving.

### Specific objective findings

- A. Decompression illness
  - 1. Cough, respiratory distress without pneumothorax.
  - 2. CNS – focal central or spinal deficits, confusion, seizures, coma.
  - 3. Cardiovascular – dysrhythmias, low BP.
  - 4. Skin – tenderness, mottling, red rash from bubble emboli.
- B. Air embolism
  - 1. Pneumothorax, tension pneumothorax.
  - 2. Focal signs as above.

### Treatment

- A. Decompression illness
  - 1. Keep patient at complete rest in supine position.
  - 2. O<sub>2</sub>, high flow (10-15 L/min), mask with reservoir bag.
  - 3. IV – volume expander (NS or RL), large bore, TKO or as directed.
  - 4. Contact base for optimum transport destination.
- B. Air embolism
  - 1. Treat as above for decompression illness.
  - 2. Observe for signs of tension pneumothorax and treat with rapid transport.
  - 3. Consider needle decompression if indicated.

### Specific precautions

Decompression illness is secondary to formation of nitrogen bubbles in the bloodstream as atmospheric pressure decreases, and excess gas comes out of solution in the blood, usually during ascent from a dive or when using pressurized breathing apparatus. Air emboli occur when decreasing pressures cause air in the lungs to over expand and rupture alveoli. In addition to lung damage, embolization of gas can cause a stroke-like picture from blocked flow in other distal arteries.

"Bends," the most common form of decompression illness, is caused by nitrogen bubbles in joints and bones, and usually occurs within 3 hours of surfacing. Though "bends" are extremely uncomfortable, they are not usually fatal, however close observation will reveal more serious forms of decompression illness.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 119 of 304
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## **DROWNING**

### **Specific information needed**

- A. How long patient was submerged.
- B. Fresh or salt water, degree of contamination, water temperature.
- C. Diving accident. Water depth.

### **Specific objective findings**

- A. Vital signs.
- B. Neurologic status – monitor on a continuing basis.
- C. Lung exam – rales, pulmonary edema, or respiratory distress.

### **Treatment**

- A. Clear upper airway of vomitus or large debris.
- B. Start CPR if needed. Do not drain lungs prior to initiating ventilatory assistance except in sea-water victims.
- C. Stabilize neck prior to removing from water if any suggestion of neck injury. Remove from water on back-board.
- D. Suction as needed.
- E. O<sub>2</sub>, high flow (10-15 L/min), mask with non-rebreathing reservoir bag, regardless of condition.
- F. If patient not awake and alert
  - 1. Assist ventilation using bag-valve-mask.
  - 2. Intubate and apply positive pressure ventilation.
  - 3. IV – volume expander (NS or RL), TKO or as directed.
  - 4. Monitor cardiac rhythm during transport.
- G. Transport patient, even if normal by initial assessment.

### **Specific precautions**

- A. Be prepared for vomiting. Patients should be secure on spine board for log-rolling to protect airway.
- B. All possible drownings or submersions should be transported. Even if patients initially appear fine, they can deteriorate. Monitor closely. Pulmonary edema often occurs due to aspiration, hypoxia, and other factors. It may not present for several hours.
- C. Beware of neck injuries – they often go unrecognized. Collar and backboard can be applied in the water.
- D. If patient is hypothermic, defibrillation may be unsuccessful until the patient is rewarmed. Prolonged CPR may be needed.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 120 of 304</p>
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## **HIGH ALTITUDE ILLNESS**

### **Specific information needed**

- A. Present symptoms – headache, trouble breathing, confusion, fatigue, nausea.
- B. Current and highest altitude, time at this altitude, duration of ascent.
- C. Medical problems, medications, previous experience at altitude.

### **Specific objective findings**

- A. Vital signs.
- B. Mental status – confusion, lack of coordination, coma.
- C. Lungs – respiratory rate, distress, wet lung sounds, sputum (bloody or frothy).

### **Treatment**

- A. Put patient at rest, position of comfort.
- B. O<sub>2</sub>, high flow (10-15 L/min), by mask with non-rebreathing reservoir bag.
- C. Reduce flow after 30 minutes to 1-2 L/min to conserve O<sub>2</sub> during long transports.
- D. Suction as needed. Assist ventilations if patient has cyanosis, confusion, and poor respiratory effort.
- E. Descend with patient at least 2,000-3,000 feet. If symptoms severe, use litter or personnel to carry patient.
- F. IV – NS, TKO, if conditions permit, or saline lock.
- G. Monitor vitals during transport.

### **Specific precautions**

- A. Recognition of the problem is the most critical part of treating high altitude illness. While in the mountains, recognize symptoms which are out of proportion to those being experienced by the rest of the party – fatigue, or trouble breathing (particularly at rest).
- B. The mainstay of treatment is descent from altitude. Even a loss of 2,000-3,000 feet makes enough difference in the O<sub>2</sub> content of air that symptoms may be relieved or stop progressing. Oxygen administration can also relieve symptoms and may allow more time for orderly evacuation.
- C. In addition to the more common pulmonary edema, cerebral edema may occur, with confusion and a stroke-like picture with focal deficits. Treatment is the same.
- D. Acute mountain sickness, the mildest form of illness during altitude adaptation, consists of fatigue, headache, and poor sleeping without CNS or respiratory symptoms. Treatment is rest and hydration. This increases the body's time to acclimatize.
- E. When evaluating high altitude illness while in the mountains recreationally, do not be overly casual. Any party member with suspected acute mountain illness who is mentally confused or who has resting tachycardia or increased respiratory rate should be helped to descend without delay. Do not allow a hiker to "rest overnight" if symptoms are present at rest OR if location is such that treatment with oxygen is not immediately available.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 121 of 304
---	-----------------------	--------------------------------

## **HYPERTHERMIA**

### **Specific information needed**

- A. Patient age, activity level.
- B. Medications – depressants, tranquilizers, alcohol, etc.
- C. Associated symptoms – cramps, headache, nausea, weakness.

### **Specific objective findings**

- A. Vital signs, temperature (Heat Stroke usually 104 degrees Fahrenheit (40 degrees Centigrade) or greater).
- B. Mental status – confusion, coma, seizures, psychosis.
- C. Skin flushed and warm – with or without sweating.
- D. Air temperature and humidity, patient dress.

### **Treatment**

- A. Ensure airway.
- B. O<sub>2</sub>, moderate flow, 4-6 L/min. Titrate to pulse oximetry > 90%.
- C. Remove clothing. Cool with water-soaked sheets. Ensure adequate air flow over patient for evaporative loss.
- D. IV – volume expander (NS or RL), large bore
  - 1. TKO if vital signs stable.
  - 2. Fluid bolus of 20 ml/kg, if signs of hypovolemia.
- E. Test blood for glucose level.
- F. Administer dextrose 50%, 50 ml IV, in secure vein, if glucose level < 60 mg/dl.
- G. Administer benzodiazepine per protocol.
- H. Monitor cardiac rhythm.
- I. Monitor vitals during transport.

### **Specific precautions**

- A. Heat stroke is a medical emergency. It is distinguished by altered level of consciousness. Sweating may still be present especially in exercise-induced heat stroke. Other persons at risk for heat stroke are the elderly and persons on medications which impair the body's ability to regulate heat.
- B. Differentiate heat stroke from – heat exhaustion (hypovolemia of more gradual onset and no mental status changes), and heat cramps (abdominal or leg cramps). Be aware that heat exhaustion can progress to heat stroke.
- C. **DO NOT LET COOLING IN THE FIELD DELAY YOUR TRANSPORT.** Cool patient as possible while enroute.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 122 of 304
---	-----------------------	--------------------------------

## **HYPOTHERMIA AND FROSTBITE**

### **Specific information needed**

- A. Length of exposure.
- B. Air temperature, water temperature, winds, patient wet, or wet clothes.
- C. History and timing of changes in mental status.
- D. Medications – steroids, alcohol, tranquilizers, anticonvulsants, others.
- E. Medical problems – diabetes, epilepsy, alcoholism, etc.
- F. With local injury – history of thawing or refreezing?

### **Specific objective findings**

- A. Vital signs, mental status, shivering. (Prolonged observation for 1-2 minutes may be necessary to detect pulse, respirations.)
- B. Temperature – core < 95 degrees Fahrenheit (35 degrees Centigrade) is significant. Note also current temperature of environment.
- C. Evidence of local injury – blanching, blistering, erythema of extremities, ears, nose.
- D. Cardiac rhythm.

### **Treatment**

#### GENERALIZED HYPOTHERMIA

- A. CPR if NO pulse or respirations. Prolonged CPR may be required. (If monitor present, no CPR if organized electrical activity present.)
- B. O<sub>2</sub>, moderate flow (4-6 L/min), warm, humidified if possible. Titrate to pulse oximetry > 90%.
- C. Avoid unnecessary suctioning or airway manipulation.
- D. Remove wet or constrictive clothes from patient. Wrap in blankets and protect from wind exposure.
- E. IV – volume expander (NS or RL), large bore, TKO or as ordered. Solution should be warmed if possible. Do not start IV until patient is moved to transport vehicle.
- F. Test blood for glucose level.
- G. Dextrose 50%, 50 ml IV in secure vein if glucose level < 60 mg/dl
- H. Consider naloxone, 0.4 mg IV for suspected narcotic toxicity.
- I. Monitor cardiac rhythm. Attempt defibrillation, if appropriate, one time only.
- J. Monitor vitals during transport.

#### LOCAL (FROSTBITE)

- A. Remove wet or constricting clothing. Keep skin dry and protected from wind.
- B. Do not allow the limb to thaw if there is a chance that limb may refreeze before evacuation is complete or if patient must walk to transportation.
- C. Rewarm minor "frostnip" areas by placing in rescuer axilla or against trunk under clothing.
- D. Dress injured areas lightly in clean cloth to protect from pressure, trauma or friction. Do not rub. Do not break blisters.
- E. Maintain core temperature by keeping patient warm with blankets, warm fluids.
- F. Transport with frostbitten areas supported and elevated if feasible.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 123 of 304
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### **Specific precautions**

#### **HYPOTHERMIA**

- A. Shivering does not occur below 90 degrees Fahrenheit (32 degrees Centigrade). Below this the patient may not feel cold, and occasionally will even undress and appear vasodilated.
- B. The heart is most likely to fibrillate below 85-88 degrees Fahrenheit (29.4-31 degrees Centigrade). Defibrillation should be attempted, but prolonged CPR may be necessary until the temperature is above this level.
- C. ALS drugs should be used sparingly, since peripheral vasoconstriction may prevent entry into central circulation until temperature is restored. At that time a large bolus of unwanted drugs may be infused into the heart. Bradycardias are normal and should not be treated.
- D. Any handling and airway manipulation may induce ventricular fibrillation in the hypothermic patient. Delay intubation if airway can be managed by less invasive means. If time permits, consider administration of prophylactic lidocaine, 1.5 mg/kg IV, approximately one minute prior to intubation.
- E. If patient has even a faint pulse, organized monitor rhythm and occasional respirations, CPR is currently felt to be unnecessary. In general, even very slow rates are probably sufficient for metabolic demands, CPR is indicated for asystole and ventricular fibrillation, though the compression rate can be slower than usual (40/minute).
- F. Patients who appear dead after prolonged exposure to cold air or water should not be pronounced "dead" until they have been rewarmed. Full recovery from hypothermia with undetectable vital signs, severe bradycardia, and even periods of cardiac arrest have been reported.
- G. Rewarming should be accomplished with careful monitoring in a hospital setting whenever possible.
- H. Early recognition of hypothermia is essential when exposed to cooling weather (either wet or cold). Death often occurs because the patient becomes apathetic, confused, and unable to help himself. When medical care is not readily accessible, rewarming may be attempted while someone goes for help. Place the patient with rescuer in sleeping bag and bundle with warm blankets.

#### **FROSTBITE**

- A. Thawing is extremely painful and should be done under controlled conditions, preferably in the hospital. Careful monitoring, pain medication, prolonged rewarming, and sterile handling are required.
- B. It is clear that partial rewarming, or rewarming followed by refreezing, is far more injurious to tissues than delay in rewarming or walking on a frozen extremity to reach help. Do not rewarm prematurely. Indications for field rewarming are few.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 124 of 304
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## **SNAKE BITES**

### **Specific information needed**

- A. Type of snake.
- B. Time of bite.
- C. Prior first-aid by patient or friends.
- D. Symptoms – paresthesias, peculiar or metallic taste sensations, local pain; later – chills, headache or nausea, numbness or tingling of mouth, tongue, other areas.

### **Specific objective findings**

- A. Bite wound – location, configuration (1, 2, or 3 fang marks, entire jaw imprint, none).
- B. Signs of envenomation – local edema or swelling, later signs may include fever, vomiting, discoloration around the fang site, hypotension.

### **Treatment**

- A. Remove patient and rescuers from area of snake to avoid further injury.
- B. Remove rings or other bands which may become tight with local swelling.
- C. Immobilize bitten part as for a fracture. Keep area of potential envenomation at or below the level of the heart.
- D. Minimize venom absorption by keeping bite area still and patient quiet.
- E. If signs of envenomation are present, apply light constricting band 1 inch wide, 2-3 inches proximal to bite. It should admit one finger under it with ease.
- F. Transport promptly for definitive observation and treatment.
  - 1. DO NOT USE ICE OR REFRIGERANTS.
  - 2. Do not make incisions or attempt to suction wound.

### **Specific precautions**

- A. Find out the specific poisonous snakes present in your region. Treatment varies; even with rattlesnakes there are regional differences in size and potency of venom. If the snake is dead, bring it in for examination. Be careful – a dead snake may still reflexively bite and envenomate.
- B. At least 25% of poisonous snake strikes do not produce envenomation. Do not overtreat the patient who does not have symptoms.
- C. Fang marks are characteristic of pit viper bites such as the rattlesnake, water moccasin, or copperhead which are native to North America. Jaw prints (without fangs) are more characteristic of nonvenomous species.
- D. Small children and elderly persons are at greatest risk from poisonous bites. Treatment should be more aggressive for these patients.
- E. Ice can cause serious tissue damage.
- F. More dangerous problems can develop from uncontrolled incision of bite wounds than from envenomation itself. Current recommendations are to avoid incisions.
- G. Exotic poisonous snakes, such as those found in zoos, have different signs and symptoms than those of pit vipers. Information should be obtained from zoo or Poison Control Center (PCC) for proper identification and treatment.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	<b>Document #</b> 04-2010	<b>Rev.:</b> <b>Page #:</b> 125 of 304
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**CHAPTER 6**

**HAZARDOUS MATERIALS PROTOCOLS**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 126 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 127 of 304
---	-----------------------	--------------------------------

## **INTRODUCTION**

This chapter is exclusively for EMS responders with additional training. This material is NOT covered in the national DOT training program. Additionally, the risks involved (to the responder) in caring for these patients are far greater than the average patient.

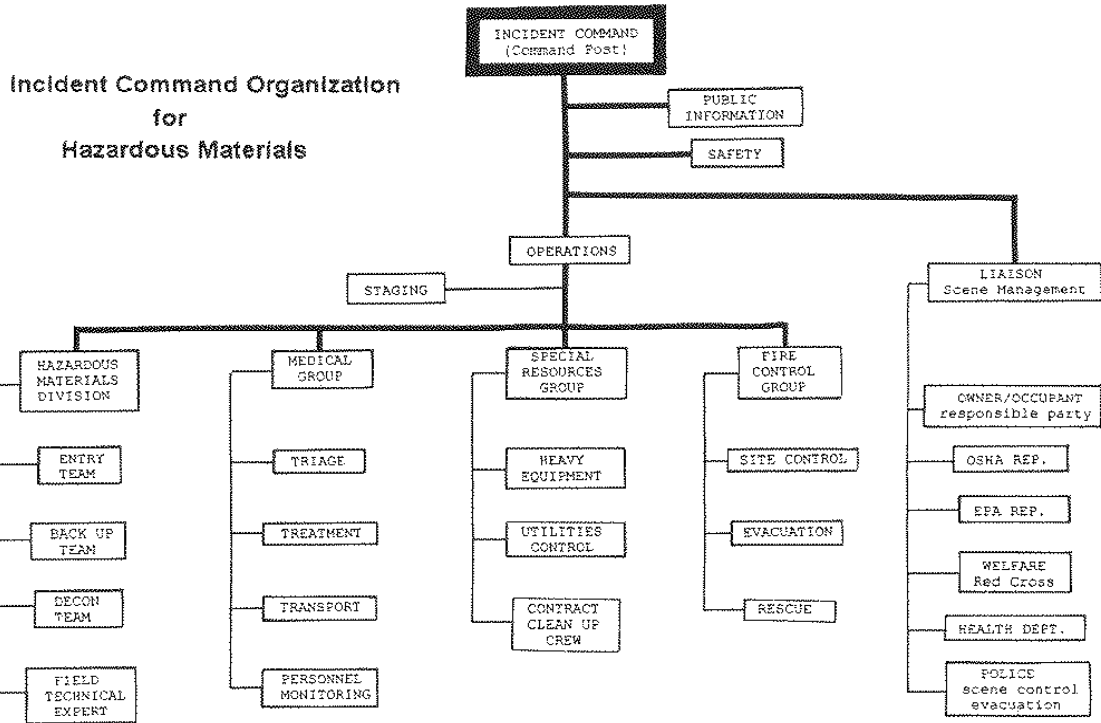
This chapter must ONLY be used by specially trained responders who work regularly with a Hazardous Materials Response Team. Those are the only personnel who will have adequate equipment, protective gear, and training to safely approach many of these patients. Safety of the rescuer is of primary importance. Unconscious or dead responders are no help to anyone!

It is critical for the average EMS responder to recognize a hazardous materials incident and notify the appropriate personnel. The following situations should raise suspicions of hazardous materials being involved

- A. Train derailments.
- B. Vehicle related incidents involving Department of Transportation (DOT) placarded vehicles or labeled substances. Any incident involving a vehicle which is used for transporting goods that has a cargo suspected to be a hazardous material whether the vehicle is placarded or not.
- C. Vehicle related incidents involving unknown loads or unusual containers including liquid and gas transporters.
- D. Incidents involving unknown or suspicious substances or odors, especially if there is a spill or leak.
- E. Incidents involving storage areas which may contain hazardous materials.
- F. Scenes with multiple victims becoming ill for unknown reasons.
- G. Scenes involving explosions or explosive substances.
- H. Incidents involving aircraft – "crop dusters" are particularly suspect.
- I. School laboratories often contain a number of dangerous chemicals.

The circumstances listed above could prove a deadly trap to the eager first responder or EMT. Restrain yourself and notify the proper authorities, before further investigation. The appropriate response to the hazardous materials incident goes against every instinct of the prehospital care provider. You can't run in to rescue someone if you might be killed in the process, but it is extremely difficult to stand back and alert authorities when your usual approach is to run in. Mentally prepare yourself ahead of time. The urge to run in is not worth your life!

### INCIDENT COMMAND ORGANIZATION



<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 129 of 304</p>
---	-------------------------------	---

## **APPROACH TO HAZARDOUS MATERIALS**

### **GUIDELINES FOR HAZARDOUS MATERIALS RESPONSE**

#### **Approach to scene**

- A. Prepare through familiarization with authorized Department of Transportation (DOT) placards, labels, 704 System, and observe site proximity for the presence of such labels.
- B. Obtain a copy of the DOT Emergency Response Guidebook and become proficient using it. Keep this book available in the vehicle at all times. Do not rely on your memory.
- C. Be suspicious of large trucks or tractor-trailers transporting goods even if placards are not visible. At buildings or locations with NFPA 704 placard, consider hazardous condition, prior to entering scene.
- D. If any serious consideration of hazardous materials contamination, contact dispatch to request Hazardous Materials Response Team (HMRT) and fire department immediately. Await arrival of responding units prior to any advancement into the scene.
- E. If dispatch information is received that a scene has hazardous materials involved or for any reason you suspect the presence of such materials **DO NOT ENTER THE SCENE!** The following guidelines should improve safety
  - 1. Observe posted barriers. (**DO NOT CROSS BARRIER TAPE!**)
  - 2. Approach uphill and upwind from the incident and only when requested or assisted by the HMRT or Incident Commander.
  - 3. For leaks from drums, small containers or tanks – maintain 600 to 800 foot distance.
  - 4. For large leaks or spills, maintain at least 1000 to 1500 feet distance.
  - 5. In the event of a fire involving hazardous materials, maintain 1/2 to 1 mile distance.
- F. An area should be established for staging ambulances as soon as possible. All crews and units shall stay in that area until advised by the HMRT or Medical Treatment Officer as designated by the Incident Command System (ICS).

#### **Scene management**

- A. Once an "Exclusion (Hot) Zone" is established there should be only one entrance and exit into that area which will be controlled by the HMRT exclusively.
- B. "Contamination Reduction (Warm) Zone" will be established for decontamination activities. Only personnel properly attired and trained for such activities will be admitted.
- C. A "Support (Cold) Zone" will contain other functions of the Incident Command System including the Staging and Treatment Areas.
- D. A "Safety Perimeter" or "Crowd Control Line" will be established at the outermost safe limits for the incident area. Only people directly involved with the incident will be admitted.
- E. Keep non-contaminated people away from the incident scene or move them uphill, upwind, at a distance that is determined to be safe.
- F. Avoid gaseous clouds, concentrations of vapor, and smoke.
- G. Do not assume that if you can't see it or smell it – it is not harmful.
- H. Keep contaminated victims away from non-contaminated people. A public address system may be necessary. Do not allow contaminated individuals, equipment, or

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 130 of 304</p>
---	-------------------------------	---

materials to leave the "Hot Zone" until it is determined by the HMRT that it can be done safely.

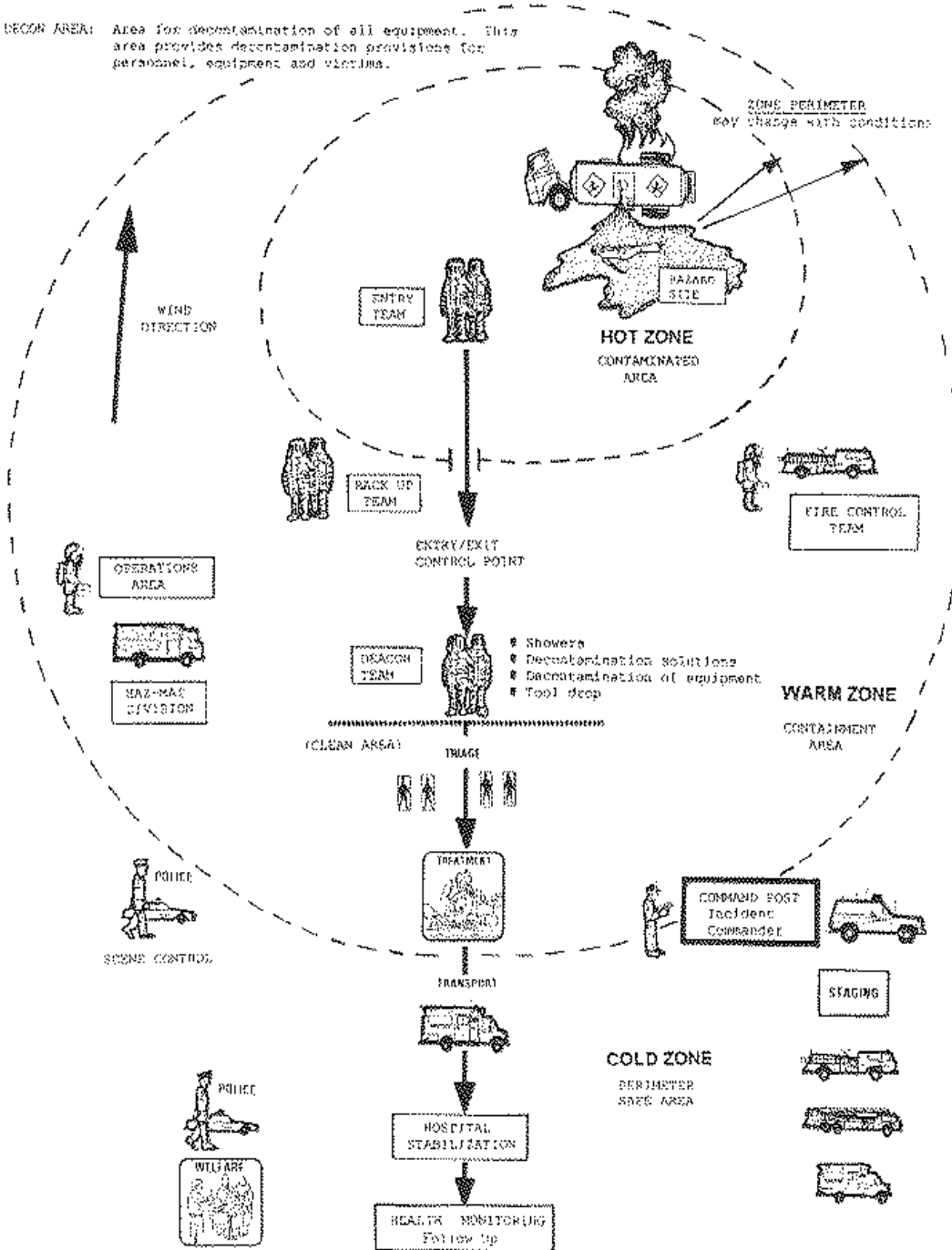
- I. Do not enter an area without permission from the HMRT (or IC) and the proper protective gear.
- J. If you find yourself in a situation where you have been contaminated or you are within a "Hot Zone" on a hazmat scene, back out to a safe position, but DO NOT LEAVE THE SCENE. Isolate yourself from others and contact the HMRT for decontamination (decon) procedures.
- K. Any information obtained about the material should be passed on to the HMRT and/or Haz Mat Paramedic to be utilized in scene mitigation.
- L. All members of HMRT will be medically evaluated and rehabilitated prior to exiting the scene. This will be managed by Haz Mat EMS providers, Medical/Rehab Sector, and the Incident Commander.
- M. *Beware of changing conditions (weather, fire size, or intensity, etc.). Be ready to retreat rapidly by way of predetermined egresses.*

**Decontamination**

- A. When the HMRT dictates that the material involved requires proper decontamination, all victims must be decontaminated by going through the HMRT decon process prior to leaving the scene. No patient will be transferred to the ambulance or emergency department until they have gone through this process. Failure to complete this step could lead to numerous unneeded exposures and a compounding of an already serious problem.
- B. All personnel involved with the decon process should be in proper protective equipment. In general, decon personnel should wear the same or one level of protection lower than the HMRT entry team.
- C. Prior to transport the receiving hospital must be notified of the situation, material involved, and that the patient has been through the decontamination process.
- D. As soon as patient numbers, information on the material, and extent of exposure has been determined, Haz Mat EMS personnel or the Medical Treatment Officer will notify the receiving hospital(s).

**Hazardous Materials Incident**

- ♦ **HOT ZONE:** Proper level of protective clothing and assigned tasks.
- ♦ **WARM ZONE:** Operations area for assigned support functions.
- ♦ **COLD ZONE:** Safe perimeter area that is monitored by response team and supported by police department.
- ♦ **DECON AREA:** Area for decontamination of all equipment. This area provides decontamination provisions for personnel, equipment and vehicles.



<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 132 of 304
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## **MEDICAL MONITORING**

The purpose of this section is to provide direction for medical personnel to perform medical monitoring of haz mat response personnel. Medical monitoring is the ongoing assessment of response personnel who are exposed to extreme environmental conditions and hazardous materials. The goal of monitoring is the early recognition and prevention of adverse effects related to a haz mat incident.

### **Objectives**

- A. Monitor baseline vital signs and pertinent assessment findings.
- B. Identify and exclude from entry any personnel at high risk from the warm and hot zones.
- C. Recognize and treat personnel with adverse effects of on-scene activities.

### **Pre-Entry Monitoring**

- A. Vital Signs – Blood pressure, pulse, respirations, temperature, pulse oximetry, ECG strip (if pulse abnormal or history of cardiac dysrhythmia).
- B. Skin Evaluation – Identify any rashes, open sores, wounds.
- C. Mental Status – Awake, alert, and oriented to time, place, person, and situation. Must have a steady gait.
- D. Medical History – Document history of any of the following
  - 1. Medications, prescription or over-the-counter within the past 72 hours.
  - 2. Alcohol consumption within the past 24 hours.
  - 3. New medical treatment or diagnosis made within the past two weeks.
  - 4. Fever, nausea, vomiting diarrhea, or cough within the past 72 hours.
- E. Weight – Measure and record each person's weight.
- F. Hydration – Each person should consume 8-16 oz. of water or diluted activity drink (1 part drink: 3 parts water).

### **Exclusion Guidelines**

Any hot or warm zone personnel with the following conditions should be excluded from entry into respective areas.

- A. Diastolic blood pressure > 105 mm Hg.
- B. Pulse > 70% of the maximum heart rate (220-age).
- C. Respiration > 24/minute.
- D. Temperature > 37.5 C (99.5 F) oral or > 38 C (100.5 F) core.
- E. Dysrhythmia not previously known and cleared by medical direction.
- F. Any open sores, large area rashes or burns (> 10%, including sunburn), or significant wounds.
- G. Any altered mental status or unsteady gait.
- H. History of nausea, vomiting, diarrhea, fever, upper respiratory infection, heat illness, or heavy alcohol intake within past 72 hours.
- I. New or changed prescription medications within the past two weeks; over the counter cold, flu, or allergy medicines taken within the past 72 hours; or beta blockers taken within the past 72 hours without clearance from medical direction.
- J. Any alcohol within the past 6 hours.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 133 of 304
---	-----------------------	--------------------------------

- K. Pregnancy.
- L. Less than 6 hours sleep in the past 24 hours.

### **Ongoing monitoring While in Hot or Warm Zone**

Any personnel noted experiencing any of the following findings should be immediately decontaminated, have their personal protective clothing removed, and be assessed.

- A. Unsteady gait, abnormal speech, abnormal behavior.
- B. Chest pain, dizziness, breathing difficulty, weakness, nausea, headache.
- C. Persistent heart rate greater than 80% of maximum calculated after resting for more than 1 minute.

### **Post-Entry Monitoring**

The same components of pre-entry monitoring should be assessed immediately

- A. and 10 minutes after decontamination and doffing of personal protection equipment. Further assessment should be completed at least every 10 minutes until heart rate is less than 75% of maximum pulse rate, and any signs of orthostasis or heat exposure have resolved.
- B. Medical direction should be contacted and further treatment and transport should be considered for
  - 1. Body weight > 3% loss or positive orthostasis.
  - 2. Pulse rate > 85% of maximum pulse at 10 minutes.
  - 3. Temperature > 38 C (100.5 F) oral or 39 C (102 F) core.
  - 4. Nausea, vomiting, diarrhea, altered mental status, respiratory, cardiac, or dermatologic complaints.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 134 of 304</p>
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### **GENERAL MEDICAL APPROACH**

- A. Protect rescuers
- B. History
- C. Patient assessment
  - 1. NEED FOR DECONTAMINATION
  - 2. Airway, breathing and circulation
  - 3. Level of consciousness and gag reflex
  - 4. Secondary survey
- D. Generalized treatment
  - 1. DECONTAMINATION
  - 2. Assure airway, breathing and circulation
  - 3. Eye irrigation
  - 4. Supportive treatment – treat signs and symptoms
  - 5. Prevention of absorption
    - a. DECONTAMINATION
    - b. Induce emesis, perform lavage
    - c. Charcoal
    - d. Cathartic
- E. Specific physiological antagonists
  - 1. Cyanide kit
  - 2. Atropine
  - 3. 2-PAM
  - 4. Methylene Blue
  - 5. Calcium gluconate
  - 6. Calcium Chloride
- F. Assess and treat for other injuries, illnesses

## ACETYL CHOLINESTERASE INHIBITORS

### Source

#### **A. INSECTICIDES**

##### **ORGANOPHOSPHATES**

Tetraethylpyrophosphate (TEPP)

Parathion

Disulfoton

Mevinphos

Highly toxic

Diazinon

Coumaphos

Chlorpyrifos

Crufomate

Trichlorfon

Moderately toxic

Malathion

Low toxicity

##### **CARBAMATES**

Aldicarb

Carbofuran

Tirpate

High toxicity

Aminocarb

Befencarb

Methomyl

Moderately toxic

Carbaryl

Low toxicity

#### **B. NON INSECTICIDE CARBAMATES**

Physostigmine (Antilirium)

Neostigmine (Prostigmin)

Edrophonium (Tensilon)

#### **C. NERVE AGENTS – usually organophosphates**

Tabun (GA)

Sarin (GB)

Soman (GD)

VX

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 136 of 304
---	-----------------------	--------------------------------

### **Clinical presentation**

- A. Early or mild exposure
  - 1. Fatigue, anorexia, nausea
  - 2. Vertigo, weakness
  - 3. Loss of concentration, blurred vision
- B. Moderate to severe exposure
  - 1. Muscarinic effects
    - D** diarrhea
    - U** Urination
    - M** Miosis
    - B** bradycardia, bronchorrhea, bronchospasm
    - E** emesis
    - L** lacrimation
    - S** salivation, secretion, sweating
  - 2. Nicotinic effects – mydriasis
    - M** mydriasis, muscle twitching and cramps
    - T** Tachycardia
    - W** Weakness
    - tH** Hypertension, Hyperglycemia
    - F** Fasciculations
  - 3. CNS effects –
    - C** Confusion
    - C** Convulsions
    - C** Coma

### **Patient Treatment**

- A. Assure safety of rescuers.
- B. Decontaminate.
- C. Airway, protect as needed.
- D. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90%.
- E. Suction as necessary.
- F. IV – volume expander (NS or RL), TKO or as directed.
- G. Administer atropine 0.5-2 mg IV, repeat every 5 minutes until bronchial secretions clear or signs of atropinization (hot, dry, flushed, or dilated pupils). Maximum dosage used – 20 mg.  
**Pediatric dose** is 0.01-0.04 mg/kg, with a minimum dose of 0.1 mg IV, repeat if needed as above.
- H. In organophosphate poisoning administer pralidoxime – 1 Gm in 250 ml D5W or NS over 10-30 minutes, may need to repeat to effect.  
**Pediatric dose** is 20-40 mg/kg up to a maximum of 1 gm administered over 10-30 minutes and repeated as necessary.
- I. Observe for seizures or pulmonary edema and treat as necessary.
- J. Transport as soon as possible.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 137 of 304</p>
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### Responder Treatment

- A. Antidotes for the treatment of responders are available in autoinjector form for IM administration.  
Mark I Kit – Atropine 2 mg, 2 Pam CL 600 mg  
CANA – Diazepam 10 mg
- B. Responders experiencing mild symptoms should self-administer 1 Mark I Kit IM into a lateral thigh (or buttocks) area.
- C. Wait 10-15 minutes after the administration of the first Mark I Kit. If you are able to walk, know who you are, and where you are, you WILL NOT need a second set of Mark I injections.
- D. If symptoms are not relieved after administer one Mark I Kit; seek someone else to check symptoms and administer a second Mark I Kit.
- E. If symptoms persist 10-15 minutes after the second Mark I Kit, a “buddy” should administer the 3rd Mark I Kit.
- F. If a provider experiences SEVERE symptoms from onset, another responder should administer 3 Mark I Kits in rapid succession.
- G. Seizures should be managed by the administration of 1 CANA IM into a lateral thigh (or buttocks) area.

### Special notes

- A. Organophosphates, carbamates, and **nerve gas** are absorbed rapidly through every route – oral, conjunctival, skin, or respiratory tract. Some act directly and very rapidly, others are toxic only after being metabolized and therefore the effects may be delayed.
- B. Organophosphates and carbamates act as acetylcholinesterase inhibitors. Acetylcholinesterase is the enzyme that digests or incapacitates acetylcholine. Acetylcholine is the primary neurotransmitter for skeletal muscle, the parasympathetic nervous system, the preganglionic sympathetic nerve endings, and much of the central nervous system (CNS). With no enzyme to digest acetylcholine the nerve endings continually fire. The effects are described as "muscarinic" (parasympathetic nerve ending stimulation), "nicotinic" (striated muscle and sympathetic ganglia stimulation) and CNS stimulation.
- C. When organophosphates and carbamates bind with acetylcholinesterase, it is initially reversible. The carbamates will spontaneously hydrolyze from the cholinesterase within 48 hours. Organophosphates will not spontaneously release, and in fact the binding is only reversible for 24 - 48 hours. After that time, if no antidote (pralidoxime) has been administered, the cholinesterase will be irreversibly destroyed.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 138 of 304
---	-----------------------	--------------------------------

## CYANIDE

### Source

#### **A. PEST CONTROL**

Vermicidal fumigant  
Insecticide  
Rodenticide  
Soil sterilization  
Coyote "gitter" traps

#### **B. INDUSTRIAL USES**

Metal polish  
Electroplating  
Extracting silver and gold from ore  
Photography  
Chemical synthesis  
Removing hair from hides

#### **C. FIRES**

Wool  
Silk  
Polyurethanes  
Polyacrylonitriles  
Horsehair

#### **D. PLANTS AND FRUIT**

Amygdalin (Laetrile)  
Peach, cherry and apricot pits  
Apple and pear seeds

#### **E. SODIUM NITROPRUSSIDE**

#### **F. CIGARETTE SMOKE**

#### **G. ARTIFICIAL NAIL REMOVERS (ACETONITRILE)**

### Clinical presentation

- A. Early or mild exposure – odor of bitter almonds
  - 1. Respiratory – tachypnea, hyperpnea
  - 2. CNS – anxiety, confusion, vertigo, headache\
  - 3. Cardiac – tachy or irregular pulse
  - 4. GI – nausea, vomiting
  - 5. Skin – flushed, hot and dry
- B. Late or severe exposure
  - 1. Respiratory – gasping efforts then apnea
  - 2. CNS – seizures and coma

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 139 of 304
---	-----------------------	--------------------------------

3. Cardiac – bradycardia and cardiovascular collapse

**Treatment**

- A. Assure safety of rescuers.
- B. Decontaminate.
- C. Airway, protect as needed.
- D. O<sub>2</sub>, high flow (10-15 L/min). Pulse oximetry will be inaccurate.
- E. Utilize Cyanide Antidote Kit only with a clear indication and patient with significant symptoms (unconscious, confused, combative). In patient with significant symptoms
  - 1. Administer amyl nitrite by inhalation. Crush ampule in handkerchief and hold in front of patient's mouth for 30 seconds, alternate with high flow oxygen every 30 seconds until IV established. Use fresh ampule every 3-4 minutes. Discontinue as soon as IV access established.
  - 2. IV – volume expander (NS or RL), TKO or as directed.
  - 3. Administer sodium nitrite 300 mg (10 ml of 3% solution) IV over no less than 5 minutes. Rate should not exceed 2.0 ml/min. Administration by drip will assure the slower rate. If drip is preferred, mix sodium nitrite 300 mg in 50-100 ml NS or D5W. Begin administration at a slow rate and monitor blood pressure. Rate can be increased if blood pressure is adequate. (Target rate is 60 ml over 5-15 minutes.) Pediatric dose is 0.2 ml/kg over not less than 5 minutes, not to exceed 10 ml. Drip is preferred for the pediatric patient to avoid severe hypotension.
  - 4. Administer sodium thiosulfate 12.5 Gm (50 ml of 25% solution) IV over 10-20 minutes. Pediatric dose is 1.5 ml/kg, not to exceed 50 ml.
  - 5. Consider other antidotes as available
- F. Administer naloxone 0.4 mg IV.
- G. If cyanide ingested – consider charcoal or gastric lavage.
- H. Transport as soon as possible – may benefit from hyperbaric oxygen therapy.

**Special notes**

- A. Cyanide is commonly formed in many varied situations. Cyanide is a common ingredient used for pest control. It is used in metallurgy for extraction of gold and silver metals from their ores. It is used in chemical synthesis and the manufacture of many plastics. It is also found in the pits of many fruits as amygdalin, which is converted to cyanide only after it is metabolized by digestion. Finally, it has been increasingly recognized that cyanide is a byproduct of many fires; and may be a cause of death in fire victims and fire fighters more often than previously recognized.
- B. Cyanide is absorbed rapidly through every route – oral, conjunctival, skin, or respiratory tract.
- C. Cyanide binds to iron in the ferric state. Any enzymes which cycle between ferric and ferrous states, are susceptible to inactivation by cyanide. The cyanoferric complex is relatively stable and the enzyme remains trapped in this inactive form of the enzyme. Cyanide produces cellular hypoxia by inhibiting the reoxidation of cytochrome oxidase. This is a hemoprotein with iron in the ferric state. It is also the final step of oxidative phosphorylation which provides the primary source of energy to the cell. Blocking this step causes the cell to utilize anaerobic metabolism. This leads to an increase of lactic acid, decrease of ATP, and eventually to cellular, organ, and organism death.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 140 of 304
---	-----------------------	--------------------------------

- D. The cytochrome oxidase-cyanide complex is dissociable. If the cyanide can be removed from the cytochrome oxidase before cellular or organism death, recovery may be the rule. The initial approach of the cyanide antidote kit is to produce methemoglobin. Both amyl nitrite and sodium nitrite will produce methemoglobinemia. This serves to attract cyanide from the cytochrome oxidase-cyanide complex to form cyanomethemoglobin complex. The methemoglobin may bind with any cyanide in the plasma, but is most effective in serving as a competitive binding site for cyanide already bound to cytochrome oxidase. Cyanomethemoglobin has relatively low toxicity. The next step in the treatment is to administer sodium thiosulfate. Sodium thiosulfate acts as a sulfur donor and permits the cyanide released from methemoglobin to combine and produce thiocyanate. The thiocyanate is relatively nontoxic and is excreted by the kidneys.
- E. Many other antidotes are currently being investigated and may be available soon. Hydroxocobalamin binds cyanide without producing methemoglobin, and does not have the side effect of significant hypotension. It is currently available in some European countries, but not in the U.S.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 141 of 304</p>
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## **METHEMOGLOBINEMIA**

### **Source**

#### **A. NITRITES AND NITRATES**

Sodium nitrites  
 Bismuth subnitrate (Pepto-Bismol)  
 Nitroglycerin  
 Nitroprusside (Nipride)  
 Nitrate-rich food or water  
 Silver nitrate  
 Volatile nitrites  
     Amyl nitrite  
     Butyl nitrite  
     Isobutyl nitrite ("Rush")

#### **B. LOCAL ANESTHETICS**

Benzocaine (Ungentine, Solarcaine)  
 Lidocaine (Xylocaine)  
 Procaine (Novocain)

#### **C. AROMATIC AMINO AND NITROSO COMPOUNDS**

Aniline dyes (inks and shoe polishes)  
 Nitrobenzene  
 Phenylhydroxylamine  
 Phenazopyridine (Pyridium)

#### **D. MISCELLANEOUS**

Sulfonamides (Dapsone)  
 Chlorates  
 Phenacetin  
 Primaquine  
 Methylene blue (large doses)

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 142 of 304
---	-----------------------	--------------------------------

### **Clinical presentation**

Methemoglobin level	Signs & Symptoms
< 10%	None
10 – 15%	Cyanosis
20 – 40%	"Chocolate cyanosis" Headache, fatigue Weakness, dizziness
40 – 60%	Lethargy, dyspnea Bradycardia Respiratory depression Stupor
60 – 80%	Seizures, coma Cardiopulmonary arrest

### **Treatment**

- A. Decontamination
  1. Clothing removed, copious washing if external or
  2. Gastric lavage or charcoal if ingested.
- B. Airway – protect as needed.
- C. O<sub>2</sub>, high flow (10-15 L/min). Pulse oximetry inaccurate.
- D. IV – volume expander (NS or RL), TKO or as directed.
- E. If patient severely confused, combative, or comatose
  1. Administer naloxone 0.4 mg IV.
  2. Administer methylene blue 1-2 mg/kg of 1% sterile solution (10 mg/ml) slowly IV over at least 5 minutes. This is equivalent to 0.1-0.2 ml/kg or total 5 to 20 ml over 10 minutes.
  3. Test blood for glucose level
  4. Administer dextrose 50%, 50 ml, IV if glucose level < 60 mg/dl.
- F. Transport as soon as possible.

### **Special notes**

- A. Nitrates and nitrites have variable rates of effect depending on the route of administration. Inhalation of the volatile nitrates cause a fall in systolic blood pressure within 30 to 60 seconds with maximum effect in 1-3 minutes. The necessary metabolism of the nitrates to the methemoglobin producing nitrites would delay the onset of symptoms. Nitrates and nitrites both produce relaxation of smooth muscle in blood vessels, GI tract, bronchi, and ureters. This dilatation has long been utilized to treat patients with coronary artery disease (initially with amyl nitrites, now with nitroglycerin). At the higher doses, and with prolonged administration, however, methemoglobinemia can be a problem even from therapeutic administration of these medications.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 143 of 304
---	-----------------------	--------------------------------

- B. Methemoglobin is an abnormal hemoglobin in which the usual reduced ferrous ( $\text{Fe}^{++}$ ) state of the heme molecule is oxidized to the ferric ( $\text{Fe}^{+++}$ ) form. Methemoglobin cannot reversibly bind or carry oxygen or carbon dioxide. The normal physiologic level of methemoglobin is less than 1%. Methemoglobinemia is defined as a methemoglobin level greater than 1%. Levels of 2-3% have been reported from use of amyl nitrites for 5 minutes. Intravenous nitroglycerin has been reported to produce levels over 12% on occasion. The administration of sodium nitrite 600 mg IV to treat cyanide poisoning, was reported to result in a methemoglobin level of 58% in one patient. Yet for all of the exposures, very few patients require treatment for methemoglobinemia, so many factors are involved in the metabolism and physiologic response.
- C. The initial presentation of methemoglobinemia is darkened blood and a "slate gray" or "chocolate brown" cyanosis. This may be apparent only around the lips and mucous membranes. This color is the result of the pigment from the abnormal hemoglobin not from hypoxic cyanosis. In most normal individuals the methemoglobin level must be above 10% before the color can be distinguished.
- D. Methylene blue acts as a cofactor in a reaction to accelerate the NADPH-dependent methemoglobin reductase system. This system requires the production of reduced NADPH by the pentose phosphate shunt, the reductase enzyme and cofactor such as methylene blue. The result is the reduced (functional) form of hemoglobin being produced from the methemoglobin (nonfunctional) form.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 144 of 304
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## SULFIDES

### Source

- A. **HYDROGEN SULFIDE**
- B. **CARBON DISULFIDE**
- C. **MERCAPTANS**
- D. **MERCAPTANS**
  - Sulfur springs
  - Volcanic gases
  - Liquid manure
  - Insecticides
  - Soil fumigants
  - Petroleum industry
  - Farming
  - Jet fuels
  - Metal refining
- E. **SULFIDES USED IN THE MANUFACTURING OF**
  - Rubber
  - Synthetic fabrics
  - Heavy water
  - Leather
  - Plastics
  - Asphalt

### Clinical presentation

- A. Low concentration
  - 1. Irritation
    - Eye – "gas eye," keratoconjunctivitis
    - Respiratory tract (pharyngitis, bronchitis)
    - Gastrointestinal tract
  - 2. Headache
  - 3. Nausea and vomiting
  - 4. Weakness
- B. High concentration
  - 1. Neurologic – Agitation, seizures, coma, respiratory paralysis.
  - 2. Cardiac – Disorders of conduction, various dysrhythmias.
  - 3. Local – Caustic burn.

### Treatment

- A. Assure safety of rescuers.
- B. Decontaminate.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 145 of 304</p>
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- C. Airway, protect as needed.
- D. O<sub>2</sub>, high flow (10-15 L/min). Pulse oximetry will be inaccurate.
- E. Administer amyl nitrite by inhalation. Crush ampule in handkerchief and hold in front of patient's mouth for 30 seconds, alternate with high flow oxygen every 30 second until IV established.
- F. IV – Volume expander (NS or RL), TKO or as directed.
- G. Administer sodium nitrite 300 mg (10 ml or 3% solution) IV over no less than 5 minutes. Rate should not exceed 2.0 ml/min. Pediatric dose is 0.2 ml/kg, not to exceed 10 ml. Administer very slowly or as drip.
- H. Observe for seizures and treat with diazepam 5-10 mg IV slowly until seizure stops or 10 mg has been given.
- I. Observe for signs of acute pulmonary edema and treat as necessary.
- J. Transport as soon as possible – may benefit from hyperbaric oxygen therapy.

**Special notes**

- A. Hydrogen sulfide is absorbed primarily through inhalation. Percutaneous absorption is minimal, although toxicity has been reported following application of sulfur-containing dermatologic preparations. Hydrogen sulfide is a highly toxic, odorous ("rotten egg" smell), and irritating gas. It is the cause of a number of fatalities, many multiple, due to inadequately protected rescuers.
- B. Hydrogen sulfide, like cyanide, binds to cytochrome oxidase and prevents aerobic metabolism at the cellular level. The administration of sodium nitrite induces methemoglobinemia which acts as a competitor with cytochrome oxidase to draw the sulfide off the enzyme to form sulfmethemoglobin. This is a relatively benign compound that is auto degraded to nontoxic forms of sulfur, which are excreted by the kidneys.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 146 of 304
---	-----------------------	--------------------------------

## FLUORIDE

### Source

#### **A. HYDROFLUORIC ACID**

- Glass etching
- Petroleum refining
- Dental work
- Rust removal
- Fertilizers
- Manufacturing
  - Fire extinguishers
  - Dyes
  - Tanning agents
  - Refrigerants
  - Plastics

#### **B. OTHER FLUORIDE COMPOUNDS**

- Sodium fluoride
- Cryolite
- Toothpaste, mouthwashes
- Insecticides and rodenticides
- Dietary supplements

### Clinical presentation

- A. Skin – Concentrated hydrofluoric acid causes lesions which are immediately, intensely painful. Dilute acid can delay treatment with prolonged absorption.
- B. Lungs – Concentrated vapors are intensely irritating to lungs and conjunctivae. May lead to respiratory tract damage and pulmonary edema.
- C. GI – Direct corrosive effect – nausea, vomiting and abdominal pain.
- D. Other
  1. Fluoride ion chelates calcium – lowers serum calcium may result in paresthesias, tetany, convulsions and cardiac dysrhythmias.
  2. Fluoride impairs the formation of collagen tissue and has direct action on muscle and nerve tissue. May result in a variety of musculoskeletal and neurologic complaints, including headache, paresthesias, visual disturbances, and mental deterioration.
  3. Fluoride interferes with many enzyme systems – glycolytic enzymes, cholinesterases, and others.

### Treatment

- A. Assure safety of rescuers.
- B. Decontaminate.
- C. Airway, protect as needed.
- D. O<sub>2</sub>, high flow (10 - 15 L/min). Titrate to pulse oximetry > 90% if possible.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 147 of 304</p>
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- E. IV – volume expander (NS or RL), wide open to 20 ml/kg, unless contraindicated by pulmonary edema.
- F. Cardiac monitor.
- G. Apply calcium gluconate gel to any skin areas which are symptomatic.
- H. For patients with significant exposure and systemic signs of hypocalcemia – administer calcium gluconate, 10% solution 10-30 ml slowly IV. Pediatric dose 0.2-0.3 ml/kg.
- I. Calcium Chloride may be used for patients with significant systemic signs of hypocalcemia – administer 5-10 ml slowly IV. Pediatric Dose 0.1-0.2 ml slowly IV>
- J. Consider administration of magnesium sulfate 1-2 Gm IV.
- K. Transport as soon as possible.

**Special notes**

- A. Hydrofluoric acid is one of the strongest acids known. It is used extensively in chemical and industrial plants for a variety of applications. On direct contact hydrofluoric acid causes liquefaction necrosis by action of the hydrogen ion that is identical to other acid burns, disrupting the outer layer of skin and immediately proceeding to destroy the subcutaneous tissues. The fluoride ion penetrates into the subcutaneous tissues and complexes with calcium and magnesium to form insoluble fluoride salts. This process continues and can result in hypocalcemia or hypomagnesemia.
- B. The fluoride ion also acts as an enzyme inhibitor which inhibits cellular metabolism. Severe hydrofluoric acid burns can be associated with systemic fluoride toxicity.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 148 of 304
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## **HYDROCARBONS**

### **Source**

#### **A. ALIPHATIC CHEMICALS**

Methane  
Ethane  
Propane  
Butane  
Hexane  
Cyclohexane

#### **B. AROMATIC HYDROCARBON**

Benzene  
Toluene  
Xylene  
Aniline  
Phenol

#### **C. HALOGENATED HYDROCARBONS**

Methyl chloride  
Methylene chloride  
Chloroform  
Carbon tetrachloride  
Ethyl chloride  
Trichloroethane  
Trichloroethylene  
Tetrachloroethylene

#### **D. MIXTURES**

Gasoline  
Mineral spirits  
Kerosene  
Turpentine  
Pine oil  
Pine tar

### **Clinical Presentation**

- A. Respiratory
1. Tachypnea
  2. Cough with sputum production
  3. Crackles and wheezes
  4. Hypoxia

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 149 of 304
---	-----------------------	--------------------------------

- B. Cardiac
  - 1. Tachycardia
  - 2. Ischemic changes
  - 3. Ventricular dysrhythmias
- C. Nervous
  - 1. Headache, dizziness, weakness, confusion
  - 2. Agitation, seizures
  - 3. General anesthesia and narcosis
  - 4. Coma
- D. Other
  - 1. Chemical burns & dermatitis
  - 2. Lacrimation, blurred vision, corneal and conjunctival irritation
  - 3. Nausea, vomiting, diarrhea
  - 4. Kidney failure

### **Treatment**

- A. Assure safety of rescuers
- B. Decontaminate (copious water & mild soap for skin)
- C. Airway, protect as needed
- D. O<sub>2</sub>, high flow 10-15 L/M). Pulse oximetry.

### **Special Notes**

- A. Exposure to hydrocarbon gases and vapors can cause simple asphyxia. If hypoxia is not corrected, the decrease in oxygen will initially cause CNS stimulation followed by CNS depression.
- B. Hydrocarbon vapors cause irritation and drying of mucous membranes in the respiratory tract. Prolonged exposure can lead to a chemical pneumonitis.
- C. Hydrocarbons are classified as volatile organic compounds which are quite flammable and frequently have carcinogenic effects. Decontamination before transport is essential. Responders should consider the use of air supplied breathing apparatus and chemical protection clothing (Level B) when caring for patients contaminated with hydrocarbons.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 150 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	<b>Document # 04-2010</b>	<b>Rev.: Page #: 151 of 304</b>
---	-------------------------------	---

**CHAPTER 7**

**PREHOSPITAL PROCEDURES**

**BASIC AND ADVANCED**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 152 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 153 of 304
---	-----------------------	--------------------------------

## INTRODUCTION

All care, in regard to the administration of medications, assessment, and performance of procedures, shall be provided in accordance with the practitioner's scope of practice, defined by the most recent version of the Colorado Board of Medical Examiners Rule 500. As such, specific care guidelines will not be delineated within these protocols, except to denote restrictions on the scope of practice. If allowed by Rule 500, we will expect the practitioners to follow appropriate guidelines.

<ul style="list-style-type: none"> <li>Airway management</li>   <li>Bandaging</li> <li>Defibrillation (AED)</li> <li>Splinting, extremity</li> <li>Splinting, spine</li> </ul>	<ul style="list-style-type: none"> <li>Opening airway</li> <li>Obstructed airway</li> <li>Clearing and suctioning</li> <li>Assisting ventilation</li> </ul>
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Advanced procedures are those techniques which require physician direction in teaching, skill maintenance, and use.

<ul style="list-style-type: none"> <li>Advanced cardiac monitoring</li> <li>Airway management</li>   <li>Airway monitoring</li>   <li>Cardioversion</li> <li>Defibrillation</li> <li>Foley catheter insertion (long transports only)</li> <li>ICD magnet</li> <li>Intraosseous cannulation</li> <li>Medication administration</li> <li>Morgan lenses</li> <li>NG tube insertion (long transports only)</li> <li>Pain management</li> <li>Peripheral IV insertion</li> <li>Pre-existing Vascular Access Device (PVAD) use</li> <li>Restraints</li> <li>Tension pneumothorax decompression</li> </ul>	<ul style="list-style-type: none"> <li>12-lead ECG</li> <li>Disposable ventilator</li> <li>Orotracheal intubation</li> <li>Nasotracheal intubation</li> <li>Rapid Sequence Intubation (RSI)</li> <li>Dual lumen airways</li> <li>Laryngeal Mask Airway</li> <li>Cricothyrotomy</li> <li>Pulse oximetry and Capnography</li> <li>Esophageal Detection Device (EDD)</li> <li>Peak Expiratory Flow Meter</li> </ul>
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 154 of 304
---	-----------------------	--------------------------------

## **ADVANCED CARDIAC MONITORING** **12-LEAD ELECTROCARDIOGRAM (ECG)**

### **Introduction**

Prehospital 12-lead electrocardiography with transmission to the emergency department may decrease the door-to-intervention time for patients with acute myocardial injury. Faster diagnosis and earlier treatment of Acute Coronary Syndromes is possible when 12-lead ECG is obtained in the field and transmitted to the receiving emergency physician.

### **Indications**

Presence of personnel APPROVED and TRAINED in the procedures who have determined an immediate need for electrocardiography.

- A. Chest discomfort (or anginal equivalents) suggestive of cardiac ischemia.
- B. Associated symptoms - nausea, vomiting, diaphoresis, respiratory difficulty.
- C. Past History - previous cardiac or pulmonary problems.

### **Precautions**

Do not delay scene time more than 4 minutes to perform 12-lead ECG.

### **Technique**

- A. Power up monitor (indicates patient contact).
- B. Remove patient's clothing above the waist. Use a gown or sheet to cover patient's torso.
- C. Select, clip any hair, abrade, and apply leads
- D. Place patient in position of comfort (supine preferred).
- E. Verify that all electrodes are securely attached.
- F. Remove any obvious sources of Electromagnetic Interference.
- G. Instruct patient to keep arms supported, and avoid movement.
- H. Acquire 12-lead ECG.
- I. Locate a suitable telephone line, and transmit significantly abnormal ECG (including ischemia, tachydysrhythmias of uncertain etiology, etc.) to receiving Emergency Department, according to manufacturer's guidelines.

### **Complications**

- A. Procedure may cause irritation of the skin or signs/symptoms of a localized reaction if the patient is allergic to adhesives.

### **Special Notes**

- A. Electrodes may not adhere if the skin is diaphoretic. Dry the skin thoroughly.
- B. Marking electrode sites is important to assure comparative placement after the patient is transferred to the receiving facility.
- C. APPROVED and TRAINED means the provider has completed a 12-lead ECG course, and reached an interpretive accuracy as defined by the medical director.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 155 of 304</p>
---	-------------------------------	---

## **AIRWAY MANAGEMENT**

### **GENERAL PRINCIPLES**

The numerous airway procedures which follow are insufficient in themselves, unless the EMT or Paramedic can decide in a practical situation which form of management should be used. The following principles should be remembered in the "heat of battle" to allow optimum care of the airway without unnecessary intervention.

- A. Use the simplest method of airway management appropriate to the patient.
- B. Use the method with which the emergency responder is most comfortable.
- C. Use meticulous suctioning to keep the airway clear of debris.
- D. Monitor continuously to be sure that the treatment is still effective.
- E. Understand the difference between various aspects of the airway management.
  - 1. **Patency** – how open and clear is the airway, free of foreign substances, blood, vomitus and tongue.
  - 2. **Ventilation** – the amount of air the patient is able to inhale and exhale in a given time.
  - 3. **Oxygenation** – the amount of oxygen the patient is carrying to his tissues.

The following protocols are recommended as a guide for approaching difficult medical and trauma airway problems. They assume that the responder is skilled in the various procedures and the protocols will need to be modified according to training level.

#### **Medical Respiratory Arrest**

- A. Open airway using head-tilt/chin-lift or jaw-thrust maneuver.
- B. Look, listen and feel for spontaneous respirations.
- C. BVM with supplemental oxygen to ventilate.
- D. Insert nasopharyngeal airway or oropharyngeal airway
- E. Suction as needed.
- F. Perform orotracheal intubation after patient otherwise stabilized prior to transport if arrest continues. If unsuccessful consider alternative airway devices.

#### **Medical Respiratory Insufficiency**

- A. Open the airway using most efficient method.
- B. Insert nasopharyngeal airway if tolerated.
- C. Suction as needed.
- D. Apply supplemental O<sub>2</sub> by nasal cannula or mask as needed.
- E. Assist respirations with bag-valve-mask as needed.
- F. Perform nasotracheal or orotracheal intubation if prolonged support is needed, or if airway requires continued protection from aspiration.
- G. Consider alternate airway devices and/or RSI.

#### **Traumatic Respiratory Arrest**

- A. Open airway using jaw-thrust maneuver, protecting neck.
- B. Clear the airway using finger sweep, suction as needed.
- C. Have assistant stabilize head and neck.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 156 of 304</p>
---	-------------------------------	---

- D. Use towel clip or hand to draw tongue and mandible forward if needed in patients with facial injuries.
- E. Use bag-valve-mask for initial control of ventilation.
- F. Perform orotracheal intubation with neck stabilized. Pressure over larynx may make intubation easier.
- G. If intubation cannot be performed due to severe facial injury, and patient cannot be ventilated with mask – perform cricothyroid stick or cricothyrotomy. Cricothyrotomy is a difficult and hazardous technique which should only be used in extraordinary circumstances. Consider alternate airway devices.

### **Traumatic Respiratory Insufficiency**

- A. Open airway using jaw-thrust maneuver, protecting neck.
- B. Clear the airway using finger sweep. Suction as needed.
- C. Have assistant provide continuous stabilization to head and neck.
- D. Use towel clip or hand to draw tongue and mandible forward if needed with facial injuries.
- E. Supplement with O<sub>2</sub>, support with mask ventilation.
- F. If patient deteriorates and cannot be supported by less invasive means
  1. Attempt orotracheal intubation with neck stabilized. Consider alternate airway devices or nasotracheal intubation if no mid-face trauma.
  2. Consider RSI.
  3. Perform cricothyroid stick or cricothyrotomy and use high frequency jet ventilation if available. Cricothyrotomy is a difficult and hazardous technique which should only be used in extraordinary circumstances.

### **DISCUSSION**

Stepwise procedures for obtaining control of the airway in medical situations have been well accepted and standardized by AHA protocol as well as practical clinical experience.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 157 of 304</p>
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## **AIRWAY MANAGEMENT**

### **OPENING THE AIRWAY**

#### **Indications**

- A. Inadequate air exchange in the lungs due to jaw or facial fracture causing narrowing of air passage.
- B. Lax jaw or tongue muscles causing airway narrowing in the unconscious patient.
- C. Noisy breathing or excessive respiratory effort due to partial obstruction.
- D. In preparation for suctioning, assisted ventilation or other airway management maneuvers.

#### **Precautions**

##### USE STANDARD INFECTIOUS PRECAUTIONS

- A. For trauma victims, keep neck in midline and avoid flexion or hyperextension.
- B. For medical patients, neck extension may be difficult in elderly persons with extensive arthritis and little neck motion. Do not use force. Jaw-thrust or chin-lift without head-tilt will be more successful.
- C. All airway maneuvers should be followed by an evaluation of their success. If breathing is still labored, a different method or more time for recovery may be needed.
- D. Children's airways have less supporting cartilage. Overextension can kink the airway and increase the obstruction. Watch chest movement to determine the best head angle.
- E. Dentures should usually be left in place since they provide a framework for the lips and cheeks and allow a more effective seal for ventilation.

#### **Technique**

- A. To OPEN THE AIRWAY initially, choose method most suitable for patient – See Table 6.1. Assess ventilation.
- B. Begin ventilation with bag-valve-mask if patient is not breathing.
- C. Relieve partial or complete obstruction, if present.
- D. Assess oxygenation. Use supplemental O<sub>2</sub> as needed.
- E. Choose method to MAINTAIN AIRWAY PATENCY during transport
  - 1. Position patient on side (if medical problem).
  - 2. Oropharyngeal airway
    - a. Choose size by measuring from mouth to margin of ear.
    - b. Depress tongue with tongue blade, or insert gently with the curve pointing UPWARD. Avoid snagging posterior tongue or palate.
    - c. Insert to back of tongue, then turn to follow curve of airway. Move gently to be sure the tip is free in back of pharynx.
  - 3. Nasopharyngeal airway
    - a. Chose size by measuring from nose to ear.
    - b. Lubricate tube gently.
    - c. Insert in right nostril, along floor of nose until flange is seated at the nostril. Keep curve in line with normal airway curve. If you meet resistance, try the left side.
- F. Listen to breathing to be sure maneuver has resolved problem.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 158 of 304
---	-----------------------	--------------------------------

- G. Consider intubation to provide adequate airway
- H. Resume ventilatory assistance and oxygenation as appropriate. Consider alternative airway device or RSI if difficulty with intubation.
- I. Consider cricothyrotomy only if unable to secure airway. Cricothyrotomy is a difficult and hazardous technique which should be used only in extraordinary circumstances.

### **Complications**

- A. Cervical spinal cord injury from neck hyperextension in trauma victim with cervical fracture.
- B. Neck fracture in older patients with rigid neck due to forced extension during airway maneuvers.
- C. Death due to inadequate ventilation or hypoxia.
- D. Nasal or posterior pharyngeal bleeding due to trauma from tubes.
- E. Increased airway obstruction from tongue following improper oropharyngeal airway placement.
- F. Aspiration of blood or vomitus from inadequate suctioning and continued contamination of lungs from upper airway.

### **Special Notes**

- A. Researchers have found that the head-tilt/chin-lift is successful at least as often as the head-tilt/neck-lift and that it may be more reliable and less fatiguing. Unfortunately, it cannot be simulated on manikins, but with use, it is easy to get comfortable with this technique.
- B. During transport, medical patients can be placed in a STABLE POSITION on their sides for effective airway control. Use a flexed leg, arms, or pillows for support. Our supine "packaging" of patients for transport is often the worst way to ensure an adequate airway.
- C. Nasopharyngeal airways are very useful for airway maintenance. The nasal insertion provides more stability, the airway is better tolerated in partially awake patients, and it does not carry the risk of blocking the airway further like the stiff oropharyngeal airway.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 159 of 304</p>
---	-------------------------------	---

## **AIRWAY MANAGEMENT**

### **OBSTRUCTED AIRWAY**

#### **Indications**

- A. Complete or partial obstruction of the airway due to a foreign body.
- B. Complete or partial obstruction due to airway swelling from anaphylaxis, croup, or epiglottitis.
- C. Patient with unknown illness or injury who cannot be ventilated after opening the airway.

#### **Precautions**

##### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Patients with partial airway obstruction can be very uncomfortable and vociferous. Abdominal or chest thrusts will not be effective and may be injurious to the patient who is still ventilating. Resist the temptation to attempt relief of obstruction if it is not complete. Be ready to intervene promptly if arrest occurs.
- B. Hypoxia from airway obstruction can cause seizures. Chest or abdominal thrusts may not be effective until the patient becomes relaxed after the seizure is over.

#### **Technique – per American Heart Association Guidelines unless otherwise noted**

##### COMPLETE AIRWAY OBSTRUCTION

- A. Open airway using head-tilt/chin-lift.
- B. Attempt to ventilate.
- C. If unable to ventilate, reposition airway and reattempt ventilation.
- D. Perform BLS obstructed airway maneuvers.
- E. If airway remains obstructed, visualize with laryngoscope and remove any obvious foreign body.
- F. Reposition the airway and attempt to ventilate.
- G. Consider intubation or cricothyrotomy if obstruction unrelieved.
- H. When obstruction relieved
  - 1. Keep patient on side, sweep airway to remove debris.
  - 2. Apply O<sub>2</sub>, high flow (10-15 L/min) by mask. Titrate pulse oximetry to 90% if possible.
  - 3. Assess adequacy of ventilation and support as needed.
  - 4. Suction aggressively.
  - 5. Gently restrain if combative or confused.

##### PARTIAL AIRWAY OBSTRUCTION

- A. Have patient assume most comfortable position.
- B. Apply O<sub>2</sub>, high flow (10-15 L/min) by mask or as high as possible through nasal cannula if mask would hinder efforts to assist patient. Titrate pulse oximetry to 90% if possible.
- C. Attempt suctioning of upper airway if patient can lie on side to protect airway and cooperate with suctioning. If obstruction is potentially caused by an infectious process (i.e., epiglottitis), DO NOT insert anything into patient's mouth
- D. If patient unable to move air, confused, or otherwise deteriorating – visualize airway, remove foreign body or perform abdominal thrusts as noted above.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 160 of 304
---	-----------------------	--------------------------------

### **Complications**

- A. Hypoxic brain damage and death from unrecognized or unrelieved obstruction.
- B. Trauma to ribs, lung, liver and spleen from chest or abdominal thrusts (particularly when forces not evenly distributed).
- C. Vomiting and aspiration after relief of obstruction.
- D. Creation of complete obstruction after incorrect finger probing or intubation attempts.
- E. Tonsillar or pharyngeal laceration from over-vigorous finger sweep.

### **Special Notes**

- A. Occasionally, patients will have a better airway in the supine than in the upright position. Let the patient assume his position of comfort.
- B. Be prepared! Patients who are relieved of airway obstruction usually vomit. They may also be confused enough after the hypoxic episode that they are unable to clear their secretions. There is no substitute for careful and aggressive suctioning.
- C. Technique of proper abdominal and chest thrusts as well as airway positions and sweeps is found in basic CPR texts. Persons who have relieved obstruction say that after 1 or 2 thrusts, it becomes very clear how much force will be needed to "pop the cork." Prehospital providers should be meticulous in their technique to minimize the possibility of injury to patient and maximize likelihood of success.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 161 of 304</p>
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## **AIRWAY MANAGEMENT**

### **CLEARING AND SUCTIONING THE AIRWAY**

#### **Indications**

- A. Trauma to the upper airway, with blood, teeth, or other material causing partial obstruction.
- B. Vomitus, food boluses or foreign material in airway.
- C. Excess secretions or pulmonary edema fluid in upper airway or lungs (with endotracheal tube in place).
- D. Meconium or amniotic fluid in mouth, nose and oropharynx of newborn.

#### **Precautions**

##### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Suctioning, particularly through endotracheal tubes, always risks suctioning the available oxygen, as well as the fluid, from the airway. Limit the suction time to a few seconds while the catheter is being withdrawn.
- B. This precaution should NOT be followed when vomitus or other material continues to well up and completely obstruct airway. In those situations suctioning must be continued until an airway is re-established.
- C. Use equipment large enough for the job at hand. Large amount of particulate matter requires open-ended suction with connecting tubing.
- D. The catheter and tubing will require frequent rinsing with water or saline to permit continued suctioning. Before beginning, have a bottle of water or saline at hand. Use gauze to remove large material from the end of the catheter.
- E. Never attempt to insert a suction catheter with the suction functioning. Suction only on withdrawal of the catheter.

#### **Technique**

- A. Open airway and inspect for visible foreign material.
- B. Turn patient on side if possible to facilitate clearance.
- C. Remove large or obvious foreign matter with gloved hands. Use padded tongue blade or oropharyngeal airway (do not pry) to keep airway open. Sweep finger ACROSS posterior pharynx and clear material out of mouth.
- D. Attach suction machine and test motor.
- E. Suction of oropharynx
  - 1. Attach tonsil tip (or use open end for large amount of debris).
  - 2. Ventilate and oxygenate the patient prior to the procedure as needed.
  - 3. Insert tip into oropharynx under direct vision with sweeping motion.
  - 4. Pinch tubing or block suction while advancing to posterior pharynx.
  - 5. Suction as the tip is gently withdrawn back through mouth.
  - 6. Continue intermittent suction interspersed with active oxygenation by mask or cannula. Use positive pressure ventilation if needed.
  - 7. If suction becomes clogged, dilute by suctioning water from a glass to unclog tubing. If suction clogs repeatedly, use connecting tubing alone or manually remove large debris.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 162 of 304
---	-----------------------	--------------------------------

- F. Catheter suction of endotracheal tube
  - 1. Attach suction catheter to tubing of suction device (leaving suction end in sterile container).
  - 2. Hyperventilate patient 4-5 times rapidly.
  - 3. Put on sterile gloves if possible.
  - 4. Detach bag from endotracheal tube and insert sterile tip of suction catheter without suction.
  - 5. When catheter tip has been gently advanced as far as possible, apply suction and withdraw catheter slowly.
  - 6. Rinse catheter tip in sterile water or saline.
  - 7. Hyperventilate patient before each suction attempt.
- G. Bulb suction of newborn
  - 1. As soon as infant's head has delivered, insert suction tip (with bulb compressed) into the nose – then release bulb while withdrawing from nose.
  - 2. Suction each nostril, then mouth if time allows.
  - 3. As soon as infant has delivered, repeat process.
  - 4. Suction trachea under direct vision with laryngoscope if there is evidence of meconium aspiration.

### **Complications**

- A. Hypoxia due to excessive suctioning time without adequate ventilation.
- B. Persistent obstruction due to inadequate tubing size for removal of debris.
- C. Lung injury from aspiration of stomach contents due to inadequate suctioning.
- D. Conversion of partial to complete obstruction by attempts at airway clearance.
- E. Trauma to the posterior pharynx from forced use of equipment.
- F. Vomiting and aspiration from stimulation of gag reflex.
- G. Induction of cardiorespiratory arrest from vagal stimulation.

### **Special Notes**

- A. Bulb suction can be used on the newborn but is not as effective as direct visualization and suction, particularly if there is any meconium to aspirate.
- B. Patients with pulmonary edema may have endless frothy secretions. Be sure to allow time for the patient to breathe, even though it is tempting to continue suctioning.
- C. Complications may be caused both by inadequate and overly vigorous suctioning. Technique and choice of equipment are very important. Choose equipment with enough power to suction large amounts rapidly to allow time for ventilation.
- D. Proper airway clearance can make the difference between a patient who survives and one who dies. Airway obstruction is one of the most common treatable causes of prehospital death.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 163 of 304</p>
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## **AIRWAY MANAGEMENT** **ASSISTING VENTILATION**

### **Indications**

- A. Inadequate patient ventilation due to fatigue, coma, or other causes for respiratory depression.
- B. To apply positive pressure breathing in patients with pulmonary edema and severe fatigue.
- C. To ventilate patients in respiratory arrest.
- D. For use in conjunction with ET tube to ventilate. (BVM or Flow Restricted Oxygen-Powered Ventilatory Device can be used for this purpose.)

### **Precautions**

#### USE STANDARD INFECTIOUS PRECAUTIONS.

- A. Mouth-to-mouth ventilation in the field should seldom be necessary for a professional response team. Airway equipment must be available.
- B. Flow Restricted Oxygen-Powered Ventilatory Device devices are very easy to use; however, you cannot feel the patient resistance and airway patency. Watch chest movement carefully! Use end tidal CO<sub>2</sub> if available.
- C. Bag-valve-mask (BVM) devices were developed for use in a controlled operating room setting. Ventilation in a field situation can be much less satisfactory. Two people are often required to obtain an adequate mask fit and also ventilate. A basic airway device should be used in conjunction with a BVM.

### **Technique**

- A. Open the airway.
- B. Check for ventilation.
- C. If patient is not breathing, perform 2 full breaths and check pulse. Begin CPR as needed.
- D. If pulse is present but patient is not breathing, continue bag-valve-mask ventilation until adjuncts are available.
- E. Attach O<sub>2</sub> to BVM.
- F. Position yourself above patient's head, continue to hold airway position, seat mask firmly on the face, and begin assisted ventilation.
- G. Utilize a basic airway (OPA, NPA).
- H. Watch chest for rise and feel for air leak or resistance to air passage. Adjust mask fit as needed.
- I. Monitor pulse oximetry and end-tidal CO<sub>2</sub>.
- J. If patient resumes respirations, attach mask strap and continue administration of supplemental oxygen. Intermittent assistance with ventilation may still be needed.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 164 of 304
---	-----------------------	--------------------------------

- K. If Flow Restricted Oxygen-Powered Ventilatory Device is to be used, again position yourself above patient, get secure mask fit. Depress button and observe for chest rise (1-2 seconds). Release and allow patient to exhale. (Exhalation should be longer than inhalation for most patients.) BE SURE AIRWAY IS OPEN TO AVOID GASTRIC DISTENTION OR HYPERINFLATION. Follow manufacturer's recommendations for use.

### **Complications**

- A. Continued aspiration of blood, vomitus, and other upper airway debris.
- B. Inadequate ventilation due to poor seal between patient's mouth and ventilatory device.
- C. Gastric distention, possibly causing vomiting. This can be particularly severe with demand valve use.
- D. Trauma to the upper airway from forcible use of airways.
- E. Pneumothorax in children.

### **Special Notes**

- A. Basic airway management will be less than adequate over long distances in the patient who continues to bleed or vomit into his upper airway. This patient will benefit from the advanced airway management techniques involved in nasotracheal or orotracheal intubation.
- B. Assisted ventilation will not hurt a patient and should be used whenever the breathing pattern seems shallow, slow, or otherwise abnormal. Do not be afraid to be aggressive about assisting ventilation, even in patients who do not require or will not tolerate intubation. (If the patient is awake enough to resist, he is probably OK without help.)

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 165 of 304</p>
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## **ADVANCED AIRWAY MANAGEMENT**

### **ALTERNATE AIRWAYS**

#### **Introduction**

This protocol is intended for approved, commercial airway devices. Some examples of these devices include the Combitube, or the LMA.

Each device will have its own idiosyncrasies, providers must be trained, knowledgeable, and experienced with the manufacturer's recommendations for the particular device being used.

#### **Indications**

- A. When immediate airway control is desired in the absence of endotracheal intubation.
- B. Airway control in the absence of other effective methods (e.g., failed airway)
- C. Situations involving a difficult mask (BVM) fit, or ineffective BVM.

#### **Precautions**

##### **USE STANDARD INFECTIOUS PRECAUTIONS**

- A. Avoid contact with sharp or pointed objects at all times. This includes broken teeth or dental work that may tear the cuffed mask.
- B. Non-disposable LMAs require specific cleaning and sterilization techniques. Refer to manufacturer's recommendations.
- C. A bite block should be used with the alternate airway and kept in place until the device is removed.

#### **Contraindications**

- A. The patient has an intact gag reflex or is not profoundly unconscious and who may resist the insertion.
- B. Severe maxillofacial or oropharyngeal trauma.
- C. Any allergy or sensitivity to latex (the Combitube's pharyngeal balloon contains latex).
- D. Inappropriate sizing (follow manufacturer's recommendations).
- E. The following contraindications apply to devices that are inserted into the esophagus.
  - 1. The patient has known esophageal disease.
  - 2. The patient has ingested a caustic substance.
  - 3. There are burns involving the airway.
  - 4. Note: Not all contraindications are absolute.

#### **Technique**

- A. Each device is unique; follow specific manufacturer's recommendations for the proper procedure for insertion and use.
- B. Assess for adequate placement by auscultation (equal breath sounds over the chest and lack of sounds over the epigastrium with bagging)  
In addition to auscultation, confirm tube placement by using either a colorimetric end-tidal CO2 detector or capnography.  
Secure the device.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 166 of 304</p>
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## ADVANCED AIRWAY MANAGEMENT

### **CRICOTHYROTOMY**

#### Introduction

Cricothyrotomy is a difficult and hazardous technique that is to be used only in extraordinary circumstances. This procedure should not be considered a mandatory skill for ALS providers. It is difficult to teach the procedure, and if the paramedic does not practice the procedure often, the skill will not be present to perform the procedure in a timely fashion. Cricothyrotomy produces far more complications than are commonly anticipated.

#### Indications

Presence of personnel TRAINED in the procedure plus inability to establish airway by any other means.

1. Acute upper airway obstruction which cannot be relieved by obstructed airway maneuvers.
2. Upper airway trauma with inability to nasally or orally intubate a patient who has severe respiratory insufficiency.
3. Inability to maintain airway with alternative airway techniques.

#### Precautions

##### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Bleeding is common, even with correct technique. It should stop once the airway is intubated. Straying from the midline is dangerous and may cause major hemorrhage by injury to the carotid or jugular vessels.
- B. Remember that the distance to the carina is very short. Care must be taken not to allow the tube to slip into the right mainstem bronchus if using an endotracheal tube for passage through the cricothyroid space.
- C. Standard cricothyrotomy is contra-indicated in children eight years of age and younger because of small cricothyroid space. A needle inserted into that space can still be life saving.

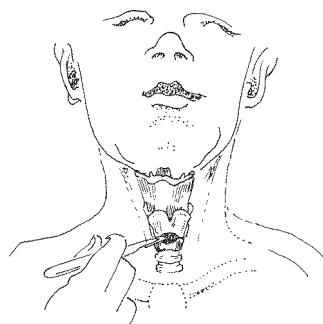
#### Technique

- A. Needle cricothyrotomy
  1. Equipment
    - a. 10, 12 or 14 gauge angiocath.
    - b. Oxygen tank with tubing and adapter.
  2. Expose the neck.
  3. Identify the trachea, palpate the prominent thyroid notch anteriorly. Palpate the cricoid cartilage inferiorly. The space between the cricoid and thyroid cartilages is the cricothyroid space, in which is located the cricothyroid membrane.



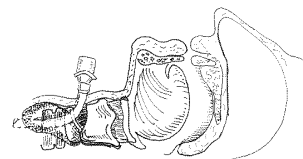
<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 167 of 304</p>
---	-------------------------------	---

4. Stabilize the trachea by holding the thyroid cartilage between thumb and fingers of left hand (if right-handed).
5. Insert the largest available angiocath (14 g or larger) through the skin, just above the cricoid cartilage and pierce the cricothyroid membrane.
6. As soon as the trachea is entered, angle inferiorly and slide needle out as you advance angiocath.
7. Ventilate patient if necessary using a 3.5mm ET adapter for the BVM
8. Dress wound.



B. Standard cricothyrotomy

1. Equipment
  - a. Scalpel and No. 11 blade.
  - b. Large curved hemostat or extra scalpel handle.
  - c. Small endotracheal tubes (up to 6 mm in adults) or tracheostomy tube if available.
  - d. Tracheostomy hook (if available).
  - e. Tracheal spreader or hemostat. or Cricothyrotomy kit
2. Expose the neck.
3. Identify the trachea; palpate the prominent thyroid notch anteriorly. Palpate the cricoid cartilage inferiorly. The space between the cricoid and thyroid cartilages is the cricothyroid space, in which is located the cricothyroid membrane.
4. Stabilize the trachea by holding the thyroid cartilage between thumb and fingers of left hand (if right-handed).
5. Make a generous vertical incision over the tracheal and cricoid cartilages. Carry the incision down through the platysma and cervical fascia.
6. Insert the tracheal hook into the cricoid space and pull the larynx anteriorly into the wound to immobilize it.
7. Make a horizontal incision the width of the cricoid space.
8. Maintain vertical traction with the tracheostomy hook and dilate the incision. Insert the tracheal spreader or hemostat with the handle directed towards the patient's feet, the tracheal hook being retracted towards the patient's chin.
9. Pass endotracheal tube about 1-1.5 inches into trachea.
10. Remove the spreader or hemostat and the tracheal hook, being careful not to injure the balloon on the tube.
11. Inflate cuff (if cuffed tube) and ventilate patient with bag, using high flow O2.
12. Check for breath sounds bilaterally, measure expired CO2 and secure tube if position is good. It may be impossible to replace if it is coughed or pulled out. It will also easily slide deeper in to the right mainstem bronchus.
13. Control bleeding and dress wound.
14. Suction trachea frequently using sterile technique. Even with inflated balloon, some blood will get into trachea, causing irritation and hypoxia.



<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 168 of 304
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### **Complications**

- A. Respiratory arrest and patient demise due to
  - 1. Severity of patient's airway injury.
  - 2. Lack of attention to other potential airway maneuvers.
  - 3. Cricothyrotomy performance which takes too long.
- B. Bleeding into airway after cuff insertion with inadequate suctioning.
- C. Bleeding within fascial planes of the neck.
- D. Subcutaneous air due to improper tube or catheter positioning, along with positive ventilation.
- E. Bleeding from superficial neck vessels is very common. Use direct pressure after tube is in place.
- F. Perforations of the esophagus from penetration by the scalpel.

### **Special Notes**

In infants, young children, and many females, the landmarks are less prominent and the thyroid gland is relatively larger, thus making needle cricothyrotomy the preferred procedure. Ventilation through angiocaths is insufficient to provide adequate gas exchange, except briefly, in adults. A needle cricothyrotomy only "buys time" until a definitive procedure can be performed.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 169 of 304</p>
---	-------------------------------	---

## **ADVANCED AIRWAY MANAGEMENT**

### **DIFFICULT AIRWAY**

#### **Definition**

A difficult airway is defined as an airway that is identified as being likely to pose substantial problems in successfully achieving oral intubation before beginning the process of intubation.

A failed airway is defined as the airway that cannot be orally intubated when difficulty was either not suspected beforehand or obvious predictors of a difficult airway were present but were ignored or unrecognized.

It must be the goal of all advanced airway management providers to identify the difficult airway before attempting intubation so that the failed airway scenario occurs at an absolute minimum.

#### **Overview**

Many patients cared for by the paramedic can be intubated without difficulty. Most of these patients are obtunded and have no gag reflex and therefore present little problem in terms of intubation. Conscious patients who present with airway or ventilatory compromise and have an intact gag reflex, are hemodynamically stable and have no anatomical or situational difficulties may be good candidates for either Rapid Sequence Intubation (RSI) or nasotracheal intubation. However, a subset of patients exist that will provide the paramedic with either potential complications for RSI selection or outright exclusion. These patients may or may not be candidates for nasotracheal intubation as an alternative. This protocol defines the criteria used to alert the paramedic to the presence of factors that may complicate an RSI procedure or contraindicate it entirely.

Remember that proper selection of the RSI patient will prevent almost all difficulties in the intubation process and minimize the occurrence of the failed airway.

#### **Relative Contraindications (L E M O N)**

- A. Look – short, bull neck, receding chin, large overbite
- B. Evaluate – 3-3-2 rule
- C. Mallampati score (III or IV)
- D. Obstruction – muffled voice, dysphagia, stridor
- E. Neck mobility – cervical collar or severe cervical osteoarthritis

#### **M O A N S (Difficult BVM ventilation)**

- A. Mask seal – beards or disruption of facial symmetry
- B. Obesity/obstruction – or advanced pregnancy
- C. Age – older faces lose muscle and tissue tone
- D. No teeth – adequate seal difficult
- E. Stiff – patients resistant to ventilation (COPD, asthma, ARDS)

#### **S H O R T (Difficult Cricothyrotomy)**

- A. Surgery (or other anterior neck disruption)
- B. Hematoma (or infectious disease disrupting anterior neck)
- C. Obesity (or other access problems)

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 170 of 304
---	-----------------------	--------------------------------

- D. Radiation distortion
- E. Tumor distorting or occluding anterior neck access

These are relative contraindications, but should be carefully considered in the clinical scenario based on the comfort level of the attending RSI paramedic and the responding crew. If risks can be reduced by assistance an RSI procedure may be easy that would otherwise be impossible. Wherever possible, reduction of relative contraindications should be accomplished when considering RSI. In general, however, two or more combinations of the relative contraindication features should result in avoidance of an RSI attempt.

### **Absolute Contraindications to RSI**

The known or suspected presence of any one of these selection features will contraindicate RSI.

- A. Mallampati IV
- B. Suspected or Known Mechanical Foreign Body in Airway
- C. Suspected or Known Laryngeal/Tracheal Disruption or Fracture (as evidenced by expanding hematoma in neck, subcutaneous air in neck or altered anterior neck anatomy)
- D. Suspected or Known Epiglottitis
- E. Evidence of Significant Oral/Pharyngeal Angiodema
- F. Significant Oral/Tracheal Burns
- G. Presence of Airway Stridor for any reason
- H. Known or Suspected Anterior Neck or Upper Chest Tumor, Recent Surgery or Bleeding
- I. Significant oral facial hemorrhage or other fluid accumulation, such that airway landmark visibility will be severely compromised.
- J. Cervical Rheumatoid Arthritis

There are three basic rules regarding patient selection that every paramedic should recall each time an RSI procedure is contemplated. These three rules incorporate and summarize the general concepts of selection criteria outlined above. The rules are actually formatted as questions the paramedics should be asking themselves as they consider an RSI procedure

1. Can I get a good facial seal with the Bag-Valve-Mask?
2. Is the airway patent?
3. Do I think I can intubate this patient?

If the answers to any of the above questions are no, the patient is ruled out as an RSI candidate.

It is important to point out that if obvious contraindications exist for the use of any appropriate alternative airway (BVM, Combitube, LMA, LMA Fastrach), RSI should not be undertaken.

### **Alternative Airway Options for the Patient with Contraindications for RSI**

- A. Nasotracheal Intubation.  
Contraindications exist for this procedure –(significant mid face trauma, suspected cribriform plate fracture, significant epistaxis or suspected blood clotting abnormalities.)
- B. “Awake” Orotracheal Intubation.  
Contraindications may overlap the RSI patient.
- C. Ventilation by BVM.
- D. Non-rebreather mask.
- E. Continuous positive pressure breathing (CPAP), if available.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 171 of 304
---	-----------------------	--------------------------------

### **Technique for “Awake “ Orotracheal Intubation**

- A. Topically anesthetize the upper airway (with 10% Benzocaine spray, Cetacaine topical anesthetic spray, Hurrricane topical anesthetic spray, or nebulize 5ml of 2% xylocaine).
- B. Inject 1.5 mg/kg of lidocaine intravenously, if the patient is at risk for ICP.
- C. Administer 0.5 mg of atropine (0.02 mg/kg to children less than 12 y/o., with a minimum of 0.1 mg and a maximum of 0.5 mg) to patients at risk for bradydysthymias/asystole and to patients requiring an antisialagogue.
- D. Lubricate the end of the endotracheal tube with 2% viscous xylocaine.
- E. Intubate the patient while talking them through the procedure.
- F. Secure the tube.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 172 of 304</p>
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## ADVANCED AIRWAY MANAGEMENT

### NASOTRACHEAL INTUBATION

#### Indications

- A. Use when intubation is indicated but oral access is not possible.
- B. Most useful in breathing, patients requiring intubation. May be better tolerated in partly conscious patients. NOT INDICATED FOR RESPIRATORY ARREST.

#### Contraindications

- A. Do not use in patients with **significant** nasal or craniofacial trauma.
- B. Do not use in patients on coumadin, plavix, or who have advanced liver disease.

#### Technique

- A. Choose correct ET tube size (usually 7 mm tube in adult). Limitation is nasal canal diameter.
- B. Position patient with head in midline, neutral position.
- C. Administer neosynephrine nasal spray in both nostrils.
- D. Lubricate ET tube and nares with Xylocaine jelly or other lubricant.
- E. With gentle steady pressure, advance the tube; rotate as needed to pass turbinates. Nasal intubation is a very gentle technique: DO NOT FORCE. Keeping the curve of the tube exactly in midline, continue advancing slowly while monitoring air exchange through tube.
- F. There will be a slight resistance just before entering trachea. Wait for an inspiratory effort before final advance into trachea. Patient may also cough or buck just before breath.
- G. Advance about one inch further, confirm tube placement with Esophageal Detector Device if available, then inflate cuff.
- H. Apply End Tidal CO<sub>2</sub>, then ventilate and check for breath sounds bilaterally.
- I. Note proper tube position and tape securely, if adequate expired CO<sub>2</sub>.

#### Complications - Same as orotracheal intubation. In addition:

- A. Further craniofacial injury, particularly in patients presenting with facial trauma.
- B. Upper airway bleeding caused by tube trauma.
- C. Vomiting and aspiration in the patient with intact gag reflex.

#### Special Notes

- A. Blind nasotracheal intubation is a very "elegant" technique. In the field, the secret of blind intubation is perfect positioning and gentle patience.
- B. Nasotracheal intubation should be a gentle alternative to orotracheal intubation. It is not indicated for the struggling, combative patient who will be the most likely to develop epistaxis which can add to the airway difficulties. It is also not indicated to test for "true" responsiveness in the unconscious patient (although sometimes you may indeed learn that they were not as deeply unconscious as previously supposed.)
- C. The orotracheal route may be preferred for the 1-2 mm increased size tube which may permit better suctioning and improved ventilation. Consider all of the alternatives when selecting an airway.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 173 of 304</p>
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## ADVANCED AIRWAY MANAGEMENT

### ONE – TIME USE DISPOSABLE VENTILATOR (SUREVENT)

#### Introduction

The SUREVENT provides constant flow, pressure-cycled, ventilatory support in either pressure control or pressure support modes. Two pressure valves are associated with the SUREVENT. The first is Peak Inspiratory Pressure, or PIP, which controls the maximum amount of air delivered to the patient at the end of inhalation, or inspiratory time (I – time). To increase the I-time, PIP should be increased and to decrease the I-time, PIP should be decreased.

PIP is controlled by a specific knob on the ventilator and is monitored directly by use of a built-in manometer. Most patients will be very adequately ventilated with the PIP level pre-set at the factory of 25cm-H<sub>2</sub>O, but in rare clinical cases PIP may have to be increased to effect adequate ventilation.

The second pressure valve is Positive End Expiratory Pressure (PEEP) which, when sensed by the SUREVENT, triggers the start of inhalation. PEEP is not adjustable on the ventilator but is always 10% of the PIP value.

Respiratory rate can be adjusted on the ventilator and this function controls exhalation time (E - time). To increase the E-time, the respiratory rate should be decreased. To decrease E-time, the respiratory rate should be increased. There are no markings on the respiratory rate (E-time) knob for specific rate settings. The operator should count the patient's respiratory rate and use clinical judgment but, most importantly, must use end-tidal CO<sub>2</sub> (ETCO<sub>2</sub>) monitoring data and pulse oximetry data to make the appropriate respiratory rate setting.

This device is intended for use with patients requiring short-term ventilatory support while being monitored by a paramedic trained in the use of mechanical ventilation with the SUREVENT.

#### Indications

- A. Patients in need of emergency, short term, constant flow, pressure-cycled ventilatory support.
- B. The SUREVENT is designed to be used with endotracheal tubes (after tracheal position has been confirmed). Intubated patients that would normally be ventilated by a bag device are the most appropriate candidates for the SUREVENT.
- C. Adult intubated patients who can be ventilated with PIP greater than 20 cm- H<sub>2</sub>O and less than 50 cm H<sub>2</sub>O.

#### Precautions

#### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Do not use in the presence of smoking or open flames.
- B. Do not leave any patient unattended, or without continuous observation.
- C. Not to be used in pediatric patients under the age of eight.
- D. Do not use if continuous end-tidal CO<sub>2</sub> capnography is not available.
- E. The SUREVENT may be used during CPR. However, caution must be taken to withhold CPR after the fifth compression (at the standard ratio of 5 compressions/ 1 ventilation) to allow the SUREVENT to fully inflate the lungs. After the ventilator has fully cycled to allow inhalation and exhalation, compressions may be resumed.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 174 of 304
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- F. Discontinue therapy if there is any equipment malfunction and resume the use of a manual bag-valve-mask device.

### **Technique**

- A. Ensure that cardiac, pulse oximetry and quantitative, end-tidal CO<sub>2</sub> capnography monitors are functional and ready.
- B. Follow Manufacturers Recommendations.

### **Special Notes**

- A. Patients connected to this device are to be monitored continuously by paramedics having successfully completed mandatory training. Do not leave the patient unattended.
- B. Most patients should be able to be ventilated using O<sub>2</sub> flow rates of 15 LPM. In rare cases, some patients may require 25 LPM.
- C. When the device fails to ventilate, the most common two reasons for this are as follows
1. There is a leak in the system. The leak can be anywhere from the connection at the O<sub>2</sub> source, to the O<sub>2</sub> connection at the device or at the endotracheal tube balloon in the trachea. Whenever a system leak is present, the device will never reach the set PIP and will maintain a slow continuous inhalation. In this circumstance, the device will not allow any exhalation. Unless the leak can be promptly located and corrected, the SUREVENT must be removed and ventilations resumed with BVM.
  2. Very high pressure exists somewhere in the system. The most common potential reasons for this include kinked tubing somewhere between the device and the patient's lungs (i.e. tubing to the ETT, or the ETT itself.) Other potential causes of high pressure include tension pneumothorax, severe COPD or pressure on the chest during CPR. In this case, the device will recognize the high pressure as having met the target PIP. The SUREVENT will be seen to rapidly cycle between a very short inhalation and a very short exhalation. In effect, the device will cycle so quickly between inhalation and exhalation that no effective ventilation can possibly take place. Unless the source of high pressure can be quickly identified and removed, the device should be discontinued and BVM ventilations resumed.
- D. This device may entrain outside air. This may be hazardous to patients in contaminated environments unless entrainment is prevented by occluding the patient demand valve.
- E. Remember that in some clinical situations with lower airway obstruction, most noticeably asthma and COPD, it is usually very desirable to allow the patient longer time to fully exhale (increased E-time) than in other patients without lower airway obstruction. In order to set the SUREVENT to accomplish this goal, either decrease the respiratory rate (increase E-time) or decrease PIP, if possible, (decreasing the I-time) - or do both. In this way the paramedic will be able to decrease the I-time:E-time ratio and prolong the available time for exhalation. In all cases, adjustments should be monitored by ETCO<sub>2</sub> capnography to ensure any changes are effective and safe.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 175 of 304</p>
---	-------------------------------	---

## ADVANCED AIRWAY MANAGEMENT

### OROTRACHEAL INTUBATION

#### Indications

In most cases, orotracheal intubation provides definitive control of the airway. Its purposes include

- A. Active ventilation of the patient.
- B. Delivery of high concentrations of oxygen.
- C. Suctioning secretions and maintaining airway patency.
- D. Prevention of aspiration (gastric contents, airway secretions, or bleeding).
- E. Prevention of gastric distention due to assisted ventilation.
- F. Administration of positive pressure for pulmonary edema.
- G. Administration of drugs during resuscitation.
- H. Allowing more effective CPR.
- I. Allowing hyperventilation to decrease PCO<sub>2</sub>, and thus, decrease intracranial pressure.

#### Precautions

##### USE STANDARD INFECTIOUS PRECAUTIONS

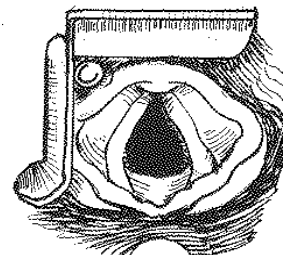
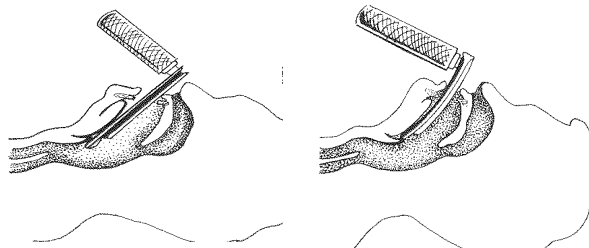
- A. Do not use intubation as the primary method of managing the airway in an arrest. Oxygenation prior to intubation should be accomplished with bag-valve-mask, as needed.
- B. Neck movement should be avoided in the trauma patient. Oral intubation or RSI with cervical stabilization is usually the best choice for a trauma patient requiring definitive airway control. Nasotracheal intubation may be an alternative in the breathing patient with no mid face trauma.
- C. Never lever the laryngoscope against the teeth. The jaw should be lifted with direct upward traction by the laryngoscope.
- D. Prepare suction beforehand. Vomiting is particularly common when the esophagus is intubated.
- E. Intubation should take no more than 15-20 seconds to complete. Do not lose track of time. If the visualization is difficult, stop and re-ventilate before trying again.
- F. No more than 3 attempts (laryngoscope into mouth) of intubation should occur before an alternate airway device is utilized.

#### Technique

- A. Assemble the equipment while continuing ventilation
  - 1. Choose tube size (see Table 6.2 below).
  - 2. Introduce the stylette and be sure it stops 1/2" short of the tube's end.
  - 3. Assemble laryngoscope and check light.
  - 4. Connect and check suction.
- B. Position patient – neck flexed forward, head extended back. Back of head should be level with or higher than back of shoulders.
- C. Give a minimum of 4 good ventilations before starting procedure.
- D. Insert laryngoscope to right of midline. Move it to midline, pushing tongue to left and out of view.
- E. Lift straight up on blade (no levering) to expose posterior pharynx.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 176 of 304</p>
---	-------------------------------	---

- F. Identify epiglottis – tip of curved blade should sit in vallecula (in front of epiglottis), straight blade should lift epiglottis.
- G. With gentle further traction to straighten the airway, identify trachea from arytenoid cartilages and vocal cords.
- H. Insert tube from right side of mouth, along blade, into trachea under DIRECT VISION.
- I. Advance tube so cuff is 1-1.5" beyond cords. Confirm tube placement with Esophageal Detector Device if available and End Tidal CO<sub>2</sub>. Ventilate and watch for chest rise. Listen for breath sounds over stomach (should not be heard), lungs and axillae.
- J. Inflate cuff with 5-10 ml air (balloon should be full, but not hard), clamp if necessary to secure against leaks.
- K. Re-auscultate over stomach and both sides of chest.
- L. Note proper tube position and secure tube if adequate expired CO<sub>2</sub>.
- M. Apply cervical collar to minimize head movement to reduce the possibility of displacing tube. Consider other immobilization as necessary.



**Complications**

- A. Hypopharyngeal/Esophageal intubation – particularly common when tube not visualized as it passes through cords. The greatest danger is in not recognizing the error. Auscultation over stomach during trial ventilation should reveal air gurgling through gastric contents with esophageal placement. Also, make sure patient's color improves as it should when ventilating. Use of expired CO<sub>2</sub> measurement will help prevent this complication.
- B. Intubation of right mainstem bronchus – listen to the chest bilaterally.
- C. Upper airway trauma due to excess force with laryngoscope or to traumatic tube placement.
- D. Vomiting and aspiration during traumatic intubation or intubation of patient with intact gag reflex.
- E. Hypoxia due to prolonged intubation attempt.
- F. Cervical spine fracture or cord damage in patients with arthritis and poor cervical mobility.
- G. Cervical cord damage in trauma victims with spine injury.
- H. Ventricular dysrhythmias or fibrillation in hypothermia patients from stimulation of airway.
- I. Induction of pneumothorax, either from traumatic insertion, forceful bagging, or aggravation of underlying pneumothorax.

**Special Notes**

- A. Orotracheal intubation can be accomplished in trauma victims if an assistant maintains stabilization and keeps the neck in neutral position. Careful visualization with the laryngoscope is needed and McGill forceps may be helpful in guiding the ET tube.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 177 of 304
---	-----------------------	--------------------------------

- B. REMEMBER: Endotracheal intubation is NOT the procedure of choice in the first minutes of resuscitation. It is a secondary procedure only. Most persons can be adequately ventilated with BVM with oropharyngeal or nasopharyngeal airway. Wait to intubate until the situation is under enough control that the procedure will be successful.
- C. Difficult intubations can occasionally be made easier by continuous pressure placed over the thyroid and cricoid cartilages, moving the vocal cords backward, upward and rightward with pressure (BURP technique).
- D. Do not be overly aggressive and quick to intubate in trauma victims with upper airway trauma. If you are able to manage secretions and ventilate, intubation is often not required and the complications may outweigh the advantages if your hand is not forced.
- E. Increased intracranial pressure frequently will result from attempts at intubation. Administration of lidocaine, 1.5 mg/kg IV, one minute before intubation attempts, may decrease this risk. Do not delay intubation, however, for IV efforts in patient with no respirations.
- F. End-tidal CO<sub>2</sub> detection is a tool to help confirm proper tube placement in patients with intact circulatory status. Those patients, when intubated properly should have a measurable expired CO<sub>2</sub> level which will confirm tube placement. Patients in cardiac arrest may have no expired CO<sub>2</sub> because of low blood flow through the lungs, resulting in poor or no gas exchange. CO<sub>2</sub> measurement in these patients may add to the confusion, rather than assist the evaluation.

<b>TABLE 6.1 OROTRACHEAL TUBE SIZE</b>	
AGE	ENDOTRACHEAL TUBE
Premie	2.5-3.0 Uncuffed
Newborn	3.0-3.5
6 months	3.5
18 months	4.0
3 years	4.5
5 years	5.0
8 years	6.0 Cuffed
10-15 years	6.5-7.0 Cuffed
Adult	6.5-7.0 Cuffed
Adult	7.0-10.0 Cuffed

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 179 of 304</p>
---	-------------------------------	---

**ADVANCED AIRWAY MANAGEMENT**  
**RAPID SEQUENCE INTUBATION (RSI)**

Only paramedics who have successfully completed an approved training program are authorized use of RSI.

**Indications**

Patients in need of secure airway with

- A. Combative closed head injury patients with or without trismus.
- B. Suspected subarachnoid hemorrhage, intracranial masses, or ischemic strokes resulting in significant impairment of mental status with resultant combativeness and/or trismus.
- C. Glasgow Coma Scale less than or equal to 8, for any reason.
- D. Status seizures (continuous seizure activity per bystander history and witnessed by EMS.)
- E. Severe respiratory distress with an intact gag reflex
- F. Severe drug overdoses

**Selection Criteria for RSI**

- A. Can I get a good facial seal with the Bag-Valve-Mask?
- B. Is the airway patent?
- C. Do I think I can intubate this patient?

If the answers to any of the above questions are no, the patient is ruled out as an RSI candidate.

**Contraindications**

- A. Any absolute contraindication to the induction agent or paralytic.
- B. Patients who do not meet the selection criteria for intubation as discussed previously.
- C. Patients who are unconscious and do not possess a gag reflex, rendering RSI medications unnecessary.
- D. Patients who are within 15 minutes from the care of an emergency physician (this includes time of evaluation, stabilization, transfer to the rig, and transport).

**Technique**

- A. Oxygenate the patient with 100% FIO<sub>2</sub> for 3 – 5 minutes. The preferred method is by non-rebreather mask. Ventilate with a bag-valve-mask only if absolutely necessary.
- B. Prepare all airway management equipment and supplies and ensure the patient has a functioning intravenous or intraosseous line. Intramuscular use of the RSI drugs is not permitted. Careful and proper preparation is a critical part of the RSI procedure.
- C. Administer 1.5 mg/kg of lidocaine IV or IO, only if the patient appears to have an obvious intracranial process or injury.
- D. Administer 0.5 mg of atropine, if the heart rate is less than 60 per minute and to all children < age 12.
- E. Administer 0.2 mg/kg of etomidate IV or IO (one time only).
- F. Administer 2.0 mg/kg of succinylcholine IV or IO (one time only).
- G. Have an assistant perform the Sellick's maneuver as soon as the patient is unconscious. Maintain Sellick's until the patient has a confirmed endotracheal tube in place or begins to regain movement.
- H. Intubate per the Orotracheal Intubation Protocol.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 180 of 304</p>
--	-------------------------------	---

- I. Confirmation steps passage through the vocal cords, prompt inflation of the EDD (not used in children < 20 kg), prompt and sustained purple - yellow color change of the end tidal CO2 detector, capnography with an upright waveform, and presence of bilateral breath sounds without epigastric sounds. Document the results of these confirmation tests on the trip report. When there is doubt about tube location, it must not be used.
- J. Consider administration of 0.1 mg/kg (0.2 mg/kg for children less < 12) vecuronium only if the endotracheal tube has been confirmed in the trachea and patient status and/or time/distance to the hospital warrants continued paralysis.
- K. If vecuronium use is indicated, either diazepam or fentanyl should be considered. Adult patients given diazepam must have a systolic blood pressure of 90 or greater. The dosage for diazepam is 0.2 mg/kg IV or IO with a maximum of 10 mg. Fentanyl is more forgiving in less hemodynamically stable patients, but still should be used with caution. The dosage for fentanyl is 0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order).
- L. Monitor the patient's airway continuously with direct observation and standard monitoring devices. If the patient's status changes, troubleshoot all aspects of the airway before providing any other interventions.
- M. Attempts to intubate the RSI patient will not exceed three (3) under any circumstances.
- N. An alternate airway will be utilized in the event intubation is unsuccessful. The first alternate airway is the bag-valve-mask (BVM). This may be the only alternate required if the patient is adequately oxygenated and ventilated and is close to the hospital. The paramedic may also choose to go to a different airway (Combitube or LMA or LMA Fastrach) in this situation. However, any inability to adequately manage the airway with a BVM mandates immediate use of one of the other alternate airways.
- O. Surgical cricothyrotomy (or needle cricothyrostomy in children < 8) will be the final alternate airway and will only be utilized if the patient continues to deteriorate due to an inadequate airway and appears in a near arrest situation. It is anticipated that very few RSI patients will ever require cricothyrotomy as an emergent alternate airway.

### **Complications**

- A. Cardiac dysrhythmias related to the use of succinylcholine.
- B. Malignant Hyperthermia or the unsuspected presence of pseudocholinesterase deficiency.
- C. Aspiration.
- D. Unrecognized esophageal intubation.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 181 of 304
---	-----------------------	--------------------------------

## **ADVANCED AIRWAY MONITORING** **ESOPHAGEAL DETECTION DEVICE (EDD)**

### **Introduction**

The EDD is a device that assists the paramedic in determining proper placement of an endotracheal tube. As has been noted in numerous studies, it is sometimes difficult to be certain whether an endotracheal tube has been placed in the trachea or inadvertently located in the esophagus. It is clear that simply auscultating the chest and abdomen may not be accurate enough in ascertaining tube location. Recognizing this reality, additional tools have been developed to provide information regarding tracheal tube placement. The EDD supplements the end – tidal CO<sub>2</sub> detector currently in use.

### **Indications**

The EDD should be used to assist in determining endotracheal tube placement in all intubated patients over the weight of 20 kg.

### **Precautions**

#### **USE STANDARD INFECTIOUS PRECAUTIONS**

- A. Use of the EDD in children under the weight of 20 kg may result in a false positive. This is because the trachea in this subset of patients is not supported by fully developed tracheal cartilages, thereby resulting in collapse of the trachea when negative pressure is applied. The EDD should not be used in children less than 20kg.
- B. Occasionally, false indications of esophageal placement may be encountered with the EDD. See the Special Notes section below for more detail on this issue and discussion of proper strategy to be followed in the event a false indication is suspected.
- C. It is critical to note that the EDD's only purpose is to suggest esophageal placement of the endotracheal tube. It does not confirm tracheal placement. If the EDD fills with air promptly, it simply means that the endotracheal tube is in an air-filled cavity, not surrounded by collapsible walls. Other structures, besides the trachea, that meet the criteria of an air-filled cavity - not surrounded by collapsible walls - include the pharynx and nasopharynx.

### **Technique**

- A. The proper sequence of endotracheal tube confirmation steps are as follows
  1. Visualization of the tube passing the cords.
  2. Application of the EDD.
  3. Use of the qualitative end-tidal CO<sub>2</sub> detector
  4. Use of capnography
  5. Auscultation of breath sounds and absence of epigastric sounds.
- B. There are two types of EDDs commonly available. The first is the bulb type EDD, which looks like the bulb on a turkey baster. At the base of the bulb is an adapter designed to fit over an endotracheal tube. The bulb type EDD is first squeezed before placement on the endotracheal tube. The compressed EDD is then allowed to fill spontaneously on the endotracheal tube. If the tube is located in an air-filled cavity, the bulb will reinflate in two seconds or less. If the tube is located in the esophagus, the EDD will take at least three seconds or longer to fill.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 182 of 304
---	-----------------------	--------------------------------

- C. The second type of EDD is the syringe type. It is a large syringe device with an endotracheal tube adapter in the end. This type of EDD is applied to the endotracheal tube and the syringe barrel is pulled. If the tube is located in an air-filled cavity, the barrel will be easily withdrawn, without resistance. If the tube is located in the esophagus, the barrel will be difficult- if not impossible- to withdraw.
- D. The EDD should always be used before ventilation is commenced with the bag (immediately after the endotracheal tube has been placed). This is because inadvertent inflation of the esophagus with air may result in filling of the EDD with air. This would result in an in EDD indication of a non-esophageal location.

### **Special Notes**

- A. Endotracheal tube obstruction, morbid obesity, pulmonary edema, mainstem bronchus intubation, or bronchospastic/obstructive lung diseases may, theoretically, lead to equivocal results due to decreased air available for aspiration. In such cases, the EDD may suggest esophageal placement when, in fact, the endotracheal tube is actually in an air-filled cavity such as the trachea. If the EDD results are equivocal, reliance on the other three confirmation steps becomes critical. Most importantly, repeat laryngoscopy may be necessary to confirm that the tube is in the trachea and in proper position between the vocal cords.
- B. When in doubt about tube location, do not use the endotracheal tube. Follow proper protocol and either re-intubate (if three attempts have not been made), or go to an alternate airway.

Do not use the EDD in children weighing less than 20kg, as outlined above.

**ADVANCED AIRWAY MONITORING**  
**PEAK EXPIRATORY FLOW TESTING**

**Indications**

- A. To assess respiratory distress in patient who is wheezing.
- B. To assess respiratory improvement after nebulizer therapy.

**Precautions**

**USE STANDARD INFECTIOUS PRECAUTIONS**

The peak flow meter will be easy to use in patients who have previously been trained to use them. They will be distracting, annoying and increase hypoxia in patients with acute respiratory distress who do not understand their use. Do not attempt to instruct a patient in use while they are acutely short of breath.

**Technique**

- A. Place the disposable mouth piece of the Wright Spirometer into the meter.
- B. Have the patient take in the deepest breath possible.
- C. Encourage the patient to seal his lips around the device and forcibly exhale.
- D. The peak rate of exhaled gas will be recorded in liters per minute.
- E. Repeat procedure to give patient the best of two attempts.
- F. Record the highest peak flow and compare to “normal” or patient’s previous values if known.

Peak Flow Values for Adults			
FEV <sub>1</sub>	FEV <sub>1</sub>	FVC	Peak Flow
Severity	(liters)	(%)	(liters/min)
Normal	4-6 L	80-90%	550-650 (male)
			400-500 (female)
Mild	3 L	70%	300-400
Moderate	1.6 L	50%	200-300
Severe	0.6 L	40%	100

**Special Notes**

- A. The measurement of the peak expiratory flow rate is effort dependent. Encourage patient to give their best effort, but do not delay treatment or transport for difficult evaluation.
- B. The normal expected peak flow is based on patient’s age, sex and height. The normals above are for “average” adults only.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 184 of 304</p>
---	-------------------------------	---

## ADVANCED AIRWAY MONITORING

### **PULSE CO-OXIMETRY**

#### Indications

- A. All persons exhibiting signs and symptoms of carbon monoxide toxicity as detailed in Carbon Monoxide Exposure Protocol must be evaluated for level of carboxyhemoglobin (COHb.)
- B. If atmospheric CO is detected at any concentration, all persons occupying the structure should be evacuated from the structure to fresh air and evaluated for blood carboxyhemoglobin (COHb) using the Masimo Rad-57 SpO2\SpCO monitor. Persons with elevated levels of COHb should be assessed and treated by EMS per the appropriate protocol.

#### Precautions

##### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Very low perfusion at the monitored site may result in inaccurate readings. If the “Low Perfusion” indication is frequently displayed, find a better perfused monitoring site.
- B. A misapplied sensor or a sensor that becomes dislodged may cause inaccurate readings.
- C. Do not use tape to secure the sensor to the site.

#### Technique

- A. Press green power button to activate unit.
- B. Place sensor on patient finger (observe top/bottom of sensor). Do not place on thumb or 5th digit. If available, utilize the pediatric sensor as instructed by the manufacturer.
- C. Four green LEDs below power button indicate battery level.
- D. Position sensor to penetrate mid-nail, not cuticle area. Do not force finger in too far.
- E. RAD-57 will calibrate on the patient in about 5-8 seconds.
- F. Displays will come up in pulse oximeter (SpO2) mode.
- G. PI graph will display perfusion strength.
- H. Display will show “SEN OFF” until sensor is on finger.
- I. Press orange “SpCO” button.
- J. Display will show SpCO level from 1% to 99%.
- K. Record level(s) on patient report.

#### Complications

None

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 185 of 304
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## **ADVANCED AIRWAY MONITORING**

### **PULSE OXIMETRY**

#### **Indications**

- A. Measurement of the percent of oxygen saturation in the peripheral capillaries.
- B. To assist with determining the optimal amount of supplemental oxygen to administer. May be particularly useful in patients with COPD or other chronic respiratory diseases.

#### **Precautions**

##### **USE STANDARD INFECTIOUS PRECAUTIONS**

- A. Do not rely on any single device to make patient care decisions.
- B. Oxygen saturation does not reflect work of breathing. Patients with adequate oxygen saturation can work so hard to achieve that saturation that they may experience abrupt respiratory failure or arrest from fatigue.
- C. Some patients with chronic lung disease do not normally have oxygen saturation greater than 90%. If titrating oxygen doses to keep the saturation above 90%, this small group of patients may slow their drive to breathe and may actually stop breathing. Be ready to support ventilation if this occurs.
- D. Patients with poor peripheral perfusion (hypovolemic shock, severe vasoconstriction from hypothermia or other conditions) may not have enough digital circulation to give accurate pulse oximetry readings. Be sure the wave form varies with pulses.
- E. In carbon monoxide poisoning, saturation measurements are normal because the disabled hemoglobin is counted as normal oxygenated hemoglobin by the sensor.

#### **Technique**

- A. Attach sensor probe to fingertip, toe or earlobe.
- B. Secure with tape if needed.
- C. Observe for a pulsing wave form to assure adequate perfusion. Confirm that pulse rate equals your measurement of this vital sign.
- D. Adjust probe to get a clear waveform.
- E. Document saturation when level stabilizes.
- F. For pediatric patient, use pediatric sensor.

#### **Complications**

May produce false reassurance in patients with some hemoglobinopathies (carboxyhemoglobin or fetal hemoglobin) who may be quite hypoxic and have normal pulse oximetry readings.

#### **Special Notes**

**Normal oxygen saturation is between 95-99%. Patients with saturation less than 90% should receive oxygen until their saturation is at the 90% level, if possible. COPD patients may be comfortable at lower levels.**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 186 of 304
---	-----------------------	--------------------------------

**ADVANCED AIRWAY MONITORING**  
**QUANTITATIVE END-TIDAL CO<sub>2</sub> MONITORING CAPNOMETRY AND  
CAPNOGRAPHY**

**Introduction**

Quantitative ETCO<sub>2</sub> simply produces a number indicating the peak ETCO<sub>2</sub> produced during one exhalation. Capnography provides both a number consistent with peak ETCO<sub>2</sub> and a waveform that makes an indirect assessment of both perfusion as well as quality and depth of ventilation. Both quantitative capnometry and capnography provide a direct determination of the respiratory rate.

One of the greatest advantages of quantitative ETCO<sub>2</sub> and/or capnography is that it provides objective evidence of endotracheal tube (ETT) placement.

**Indications**

- A. Quantitative ETCO<sub>2</sub> and/or capnography is indicated and required on all intubated patients. Additionally, it may be utilized with Combitubes or LMAs to assist in monitoring adequacy of ventilations with these alternate airway devices. If immediately available, it may be used as the ETCO<sub>2</sub> detector required in the confirmation steps mandated after endotracheal intubation. Otherwise, the colorimetric ETCO<sub>2</sub> device will be used for the specific indication of ETT confirmation while the quantitative/capnographic detector is being readied for use.
- B. Capnography is required on all patients undergoing ventilations with the one-time use, disposable ventilator.
- C. If available, non-intubated determinations of capnometry and/or capnography are indicated in any patient deemed to have respiratory difficulty, not requiring immediate intubation. Any provider concern regarding a patient's ability to ventilate or oxygenate or to maintain perfusion adequately should result in placement of a cannula capable of determining ETCO<sub>2</sub>.
- D. If use of Continuous Positive Airway Pressure (CPAP) is indicated, nasal cannula ETCO<sub>2</sub> must be used, if available. The ETCO<sub>2</sub> cannula may fit under the CPAP mask or the cannula may be modified to a fit onto a CPAP mask port for monitoring.
- E. Prehospital use of any drug that is known to potentially produce sedation and possible respiratory depression will require placement of an ETCO<sub>2</sub> nasal/oral cannula, if available. Such drugs include, but are not limited to, benzodiazepines (ex. diazepam) and/or narcotics (ex. morphine, fentanyl).

**Precautions**

**USE STANDARD INFECTIOUS PRECAUTIONS**

- A. All forms of end tidal CO<sub>2</sub> measuring devices require the patient to be able to produce exhaled CO<sub>2</sub>. End – tidal CO<sub>2</sub> production is critically dependant on blood movement through the lungs, or “perfusion.” Therefore, patients in shock due to low blood flow states will produce significantly lowered quantities of ETCO<sub>2</sub> (and lower amplitude waves in capnography) in comparison to normally perfusing patients.
- B. Patients in cardiac arrest produce little end-tidal CO<sub>2</sub>. In these patients end-tidal CO<sub>2</sub> may not be adequately detected by colorimetric ETCO<sub>2</sub> detectors.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 187 of 304
---	-----------------------	--------------------------------

- C. There is evidence to suggest that patients in cardiac arrest not able to sustain ETCO<sub>2</sub> levels greater than 10mmHg, despite intensive ALS resuscitation attempts are unlikely to survive. However, the criteria of an ETCO<sub>2</sub> less than or equal to 10mmHg will not in itself be criteria to request a DOA from Medical Control. The ETCO<sub>2</sub> may be used as an adjunct to other accepted indications for cessation of resuscitation efforts, but not the exclusive indication.

### **Technique**

- A. The specifics will vary depending on the particular type of ETCO<sub>2</sub> unit used. In general, there are hand held models that may or may not be capable of both capnometry and capnography. With some exception, these units generally are not capable of printing out the data they have generated, but may have the ability to store some of that data for later retrieval via computer. Other ETCO<sub>2</sub> detectors are contained within existing cardiac monitors. These detectors will usually have the ability to print out data and generate ETCO<sub>2</sub> waveforms (capnography).
- B. Appropriate tubing should be connected from the patient to the monitor housing. The appropriate adapter should be fitted in-line to the patient's ETT and ventilation system. Sufficient time should be allowed for the device to acquire a signal from the patient.
- C. If the device is simply a capnometric unit, read the ETCO<sub>2</sub> number generated on the device's digital display. This represents the patient's peak ETCO<sub>2</sub>. The normal ETCO<sub>2</sub> ranges from 35-40mmHg. Additionally, most capnometric devices will provide a number representing the respiratory rate. Make appropriate adjustments to the patient's oxygenation and ventilation as needed, based on the data provided. Failure to generate any ETCO<sub>2</sub> number after intubation means the ETT is not in the trachea, or less likely, the airway is completely obstructed. In either case, the ETT should be replaced immediately.
- D. If the unit is capable of capnography, configure the monitor such that the waveform can be seen on the monitor. Additionally, these units will supply the numeric peak ETCO<sub>2</sub> and the respiratory rate.
- E. Depending on the type of detector used, printouts of the data collected may or not be possible. If a hard-copy can be obtained of the data, this should be done as soon as possible. Importantly, at least one other copy attached to the TRIP REPORT.
- F. If a non-intubated cannula ETCO<sub>2</sub> detector is available and has been used for a patient, a printout waveform, if the device has the capability to produce a hard copy should be left with the patient record and also with the TRIP REPORT or the QI Program Manager.

### **Special Notes**

- A. The most important component of virtually all prehospital ETCO<sub>2</sub> detectors is the ability to prove the tracheal location of an ETT. Therefore every effort should be made to save all data generated on ETCO<sub>2</sub> monitoring of the intubated patient for future review.
- B. Some specific clinical conditions may be more ideally managed at specific ETCO<sub>2</sub> target values. In general, in patients that are hemodynamically stable, target peak ETCO<sub>2</sub> readings should be between 35 – 40mmHg. Head injured patients receiving positive pressure ventilation of any sort should have a target ETCO<sub>2</sub> of 30mmHg.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 188 of 304
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## **BANDAGING**

### **Indications**

- A. To stop external bleeding by application of direct and continuous pressure to wound site.
- B. To protect patient from contamination to lacerations, abrasions, burns.

### **Precautions**

#### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Although external skin wounds may be dramatic, they are rarely a high management priority in the trauma victim.
- B. Wounds containing large amounts of clotted blood may not stop bleeding readily. Gently remove the clots with sterile gauze or irrigating saline before dressing.

### **Equipment**

1000 ml normal saline for irrigation

Dressings: 4x4 sterile gauze material or large absorbent sterile dressing material

Bandages: Self-adherent gauze materials (rolled), Clean cloths or triangular bandages, tape, tourniquet and approved hemostatic agents

### **Technique**

- A. Stop exsanguinating hemorrhage with direct pressure, tourniquet, or approved hemostatic agents. Use clean cloth or dressing.
- B. Assess patient fully and treat all injuries by priority once assessment is complete.
- C. Remove gross dirt and contamination from wound – remove clothing if easily removable, rinse dirt, gasoline, acids, or alkalis.
- D. Evaluate wound for depth, presence of fracture in wound, foreign body, or evidence of injury to deep structures. Note distal motor, sensory, and circulatory function prior to applying dressings.
- E. Apply sterile dressing to wound surface or hemostatic agents (per discretion of agency medical director.) Touch outer side of dressing only.
- F. Apply splint over dressing if needed.
- G. Wrap dressing with clean gauze or cloth bandages, applied just tightly enough to hold dressing securely (if no splint applied).
- H. Assess wound for evidence of continued bleeding.
- I. Check distal pulses, color, capillary refill, and sensation after bandage applied.
- J. Continue to apply direct hand pressure over dressing or use air splint if bleeding not controlled with bandage alone.

### **Complications**

- A. Loss of distal circulation from bandage applied too tightly around extremity. Do not use elastic bandages nor apply bandages too tightly for this reason.
- B. Inadequate hemostasis – some wounds require continuous direct manual pressure to stop bleeding.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 189 of 304
---	-----------------------	--------------------------------

## **CARDIOVERSION**

### **Indications**

Use only in emergency situations where there is a rapid rhythm (usually greater than 150) associated with inadequate cardiac output and signs of poor perfusion (confusion, coma, angina, systolic BP < 90 mm Hg)

1. Ventricular tachycardia
2. Supraventricular tachycardia (PSVT, acute atrial fibrillation, or atrial flutter)
3. Unknown – wide complex (ventricular vs. supraventricular) tachycardia.

### **Precautions**

#### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Precautions for defibrillation apply. Protect rescuers!
- B. A patient who is talking to you is probably perfusing adequately.
- C. If the defibrillator does not discharge on "synch" with tachycardia, turn off "synch" button and refire. The waves may not have enough amplitude to trigger the synch mechanism.
- D. If sinus rhythm is achieved, even transiently, with cardioversion, subsequent cardioversion at a higher energy setting will be of no additional value. Leave the setting the same; consider correction of hypoxia, acidosis, etc., to hold the conversion.
- E. If the patient is pulseless, begin CPR and treat as cardiac arrest, even if the electrical rhythm appears organized (see PEA).

#### **Technique – per American Heart Association Guidelines unless otherwise noted**

- A. Administer O<sub>2</sub>, high flow (10-15 L/min) by mask.
- B. Start IV prior to procedure – NS, TKO.
- C. Assemble resuscitation equipment – suction, bag-valve-mask, NP or OP airways, laryngoscope, and intubation tubes.
- D. Premedicate with benzodiazepine, fentanyl, or etomidate if patient alert.
- E. Attach monitor and select lead that gives upright QRS complex.
- F. Turn synchronizer switch to "on" position.
- G. Set charge at 100 joules or manufacturer's recommendations.
- H. Hold firing buttons depressed until synchronizer fires defibrillator.
- I. If no firing occurs and patient is in wide complex tachycardia, turn off "synch" switch and refire.
- J. If firing occurs but rhythm does not convert, turn machine up in 100 joule increments or manufacturer's recommendations and refire as needed.
- K. If patient is cardioverted into or progresses to ventricular fibrillation, immediately
  1. Increase charge to defibrillation level per manufacturer's recommendations.
  2. Recharge defibrillator.
  3. Turn off "synch" switch.
  4. Defibrillate.

### **Complications**

- A. Erythema or irritation of skin will occur, particularly if good lubrication and skin contact are not achieved.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 190 of 304
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- B. Muscle cramps and pain in an awake patient.
- C. Ventricular fibrillation and asystole occur rarely and usually in the digitalis-toxic patient.

**Special Notes**

- A. Cardioversion is rarely indicated in children.
- B. Tachycardias are particularly devastating in patient with artificial valves which cannot move fast.
- C. People with chronic atrial fibrillation are very difficult to convert and their atrial fibrillation is not usually the cause of their decompensation. If you get a history of "irregular heartbeat," look elsewhere for the problem.
- D. Sinus tachycardia can occur up to 160-180 beats/minute. It is a symptom of an underlying problem. The patient must be treated for the underlying cause. Cardioversion is NOT indicated. Initial treatment should be as for shock if perfusion is poor.
- E. IV diazepam (5-10 mg in adult), fentanyl (0.5 to 1mcg/kg) or etomidate (0.2 mg/kg) may be used in conscious patients prior to cardioversion.
- F. Do not be overly concerned about the dysrhythmias that normally occur in the few minutes following successful cardioversion. These usually respond to time and adequate oxygenation and should only be treated if they persist more than 5 minutes.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 191 of 304
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## **CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP)**

### **Purpose**

CPAP provides a non-invasive method of assisting a patient's ventilation and oxygenation, and often times will eliminate the need for endotracheal intubation and protracted ventilator dependency. Its primary indication is for use in CHF and ARDS patients; however patients in respiratory failure from exacerbated COPD and asthma may also realize significant benefit from the therapy.

### **Actions**

CPAP works by providing continuous pressure on the lower airway structures, which decreases the patient's work of breathing while improving oxygen/carbon dioxide exchange and cardiac output. Be aware that increased intrathoracic pressures, which can result in decreased cardiac preload, may result with the use of CPAP.

### **Indications: COPD and CHF**

Symptomatic patients with moderate-to-severe respiratory distress as evidenced by at least 2 of the following:

- A. Rales (Crackles)
- B. Dyspnea with hypoxia
- C. SpO<sub>2</sub> < 90% unresponsive to conventional O<sub>2</sub> therapy
- D. Verbal Impairment – i.e. cannot speak in full sentences
- E. Accessory muscle use
- F. Respiratory rate > 24/min unresponsive to conventional O<sub>2</sub> therapy
- G. Diminished tidal volume

### **Indications: Asthma**

May be considered for asthmatic patients who are refractory to standard treatments

### **Contraindications**

- A. Respiratory or cardiac arrest
- B. Systolic blood pressure <90 mmHg
- C. Significant altered level of consciousness
- D. Persistent nausea or vomiting
- E. Penetrating trauma to head or chest
- F. Signs and symptoms of pneumothorax
- G. Inability to maintain airway patency
- H. Significant facial injury preventing mask seal
- I. Non-availability of continuous ET/CO<sub>2</sub> capnography
- J. Suspected significant intracranial hemorrhage

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 192 of 304
---	-----------------------	--------------------------------

### **Technique**

- A. Place patient in a seated position (preferably with legs dependant).
- B. Assess vital signs (BP, HR, RR, SpO<sub>2</sub>, ETCO<sub>2</sub>) Treat patient according to established protocols throughout CPAP therapy.
- C. Apply the CPAP mask to patient and run the device as per manufacturer recommendations.
- D. Adjust oxygen flow rate to 15 L pm initially. Monitor patient continuously, recording vital signs every 5 minutes.
- E. Start with the lowest continuous pressure that appears to be effective. Adjust pressure following manufacturer instructions to achieve the most stable respiratory status utilizing the signs described below as a guide.
- F. Assess patient for improvement as evidenced by the following
  1. Reduced dyspnea
  2. Reduced verbal impairment
  3. Reduced respiratory rate
  4. Reduced heart rate
  5. Increased SpO<sub>2</sub>
  6. Stabilized blood pressure
  7. Appropriate ETCO<sub>2</sub> values and waveforms
  8. Increased tidal volume
- G. Should the patient fail to show improvement as evidenced by
  1. Sustained or increased heart rate
  2. Sustained or increased respiratory rate
  3. Sustained or decreasing pulse oximetry readings
  4. Decrease in level of consciousness
  5. Rising ETCO<sub>2</sub> levels or other ETCO<sub>2</sub> evidence of ventilatory failure
  6. Diminished, or no improvement in, tidal volume

\*\*Troubleshoot equipment!

\*\*Endotracheal intubation should be considered!

\*\*Assess need for possible chest decompression due to pneumothorax!

\*\*Assess for possibility of hypotension and resultant hypoxia due to significantly reduced preload!

### **Documentation**

- A. The narrative of the PCR must reflect the use of CPAP, as well as oxygen flow rate with resultant PEEP, response to CPAP therapy, and ETCO<sub>2</sub> values.
- B. Include tracings of the cardiac rhythm and ETCO<sub>2</sub> waveforms.
- C. Vital signs MUST be documented every 5 minutes.

### **Special Notes**

- A. Nasal capnography cannulas should be placed under the CPAP mask to continuously monitor ETCO<sub>2</sub>.
- B. If in-line nebulization is required, it should be incorporated into the system in a manner which is consistent with manufacturer guidelines.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 193 of 304
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## DEFIBRILLATION

### Indications

- A. Ventricular fibrillation by monitor.
- B. Ventricular tachycardia in the pulseless and unconscious patient.

### Precautions

#### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Do not treat the monitor strip alone. Treat the patient! A patient who is talking is not in ventricular fibrillation, whatever the monitor shows. Artifact can commonly simulate ventricular fibrillation.
- B. Dry the chest wall if wet. Do not drip saline or electrode jelly across the chest. This results in bridging, which conducts the current through the skin rather than through the heart.
- C. Nitroglycerin paste, which is commonly used by cardiac patients, is flammable and may ignite if not wiped from the chest prior to defib.
- D. Defibrillation should be accompanied by visible muscle contraction by patient. If this does not occur, the paddles did not discharge. Recheck equipment.
- E. Unsuccessful defibrillation is often due to hypoxia or acidosis. Careful attention to airway management and proper CPR is important.
- F. Protect rescuers – "CLEAR" the area!

#### Technique – per American Heart Association Guidelines unless otherwise noted

- A. Establish unresponsiveness/pulselessness.
- B. Follow AHA and monitor/defibrillator manufacturer guidelines

### Special Notes

- A. Defibrillation is not the first step in treating fibrillation due to traumatic hypovolemia. CPR and fluid resuscitation is first.
- B. Defibrillation may not be successful in ventricular fibrillation due to hypothermia until the core temperature is above 88 degrees Fahrenheit (31 degrees Centigrade). Attempt to defibrillate, but prolonged CPR during rewarming may be necessary before conversion is possible.
- C. Dysrhythmias are common following successful defibrillation. They respond to time and adequate oxygenation. Treat only if persisting > 5 minutes.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 194 of 304
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## FOLEY CATHETER INSERTION

### Indications

In patients being treated with diuretics when transport time is long

### Precautions

#### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Contraindicated in patients with bleeding from the urinary meatus.
- B. Relatively contraindicated in the presence of pelvic or abdominal trauma. An attempt may be made to pass the catheter but extreme caution must be exercised. Keep a high index of suspicion that trauma to the urinary tract may exist. If any resistance is felt during insertion, procedure must be discontinued.
- C. Do not inflate balloon without free flow of urine.

### Technique

- A. Assemble equipment and explain procedure to patient if conscious. (Prepackaged Foley catheter insertion set is preferred.)
- B. Drape and position patient, preferably in frog-leg position, exposing perineum.
- C. Wash hands.
- D. Open tray.
- E. Put on sterile gloves.
- F. Pour antiseptic over cotton balls.
- G. Place underpad under buttocks with absorbent side up.
- H. Lift plastic tray from carton and place on underpad.
- I. Unfold fenestrated drape and cover area around genitalia.
- J. Open lubricant and squeeze onto underpad.
- K. In female
  - 1. Separate labia gently with thumb and forefinger, spread out and up (THIS GLOVE IS CONTAMINATED AND WILL REMAIN IN THIS POSITION DURING PROCEDURE).
  - 2. Using forceps to hold absorbent cotton balls, use one at a time with single downward stroke and cleanse the far side of exposed area, near and then directly over meatus. Repeat several times. Discard cotton balls.
  - 3. Position catheter tray between patient's thighs.
  - 4. With uncontaminated hand, pick up the catheter at least 3 inches from tip. Lubricate.
  - 5. Identify meatus. Insert catheter gently. NEVER FORCE.
- L. In male
  - 1. With one hand, grasp the penis and hold it securely. If there is foreskin, it should be gently retracted as you grasp penis and held back to prevent it from contaminating area around meatus (THIS GLOVE IS NOW CONTAMINATED AND WILL REMAIN IN THIS POSITION DURING PROCEDURE).
  - 2. Wash glans (or meatus) of penis with saturated absorbent cotton balls. Begin with meatus and wipe glans with circular motion. Repeat several times. Discard cotton balls.
  - 3. Hold penis forward and slightly upward to stretch urethra.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 195 of 304</p>
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4. With uncontaminated hand, pick up the catheter at least 3 inches from tip. Lubricate.
  5. Insert about 7 inches, touching the tubing to be inserted as little as possible while inserting.
  6. To assist insertion, ask patient to try to void if conscious. Changing the angle of traction on the penis may also assist in insertion.
- M. Insert catheter 3-4 inches after first urine flow.
  - N. Inflate balloon with prefilled syringe (if discomfort or resistance, deflate, advance further and reinflate).
  - O. Withdraw catheter slightly (and gently) to be sure balloon is inflated.
  - P. Attach catheter to drainage set.
  - Q. Tape catheter firmly to anterior thigh. This tape should absorb all traction forces on the system. No traction should exist on the catheter or balloon itself.
  - R. Recheck drainage system for leaks.
  - S. Dry area.
  - T. Remove drapes and make patient comfortable.
  - U. Do not raise bag above bladder level if possible.

### **Complications**

- A. Forcing the catheter in the presence of a urethral tear can create a false channel and increase the injury.
- B. Infection due to poor technique is common.

### **Special Notes**

- A. Return of grossly bloody fluid without resistance does not mean you must stop the procedure, as long as it has been otherwise normal and you feel reasonably sure you are in the bladder. Notify base physician.
- B. If, for any reason, the catheter is to be removed, remember to deflate the balloon prior to gently withdrawing the catheter.
- C. If catheter obstruction is suspected, contact base for directions.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 196 of 304
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## **ICD MAGNET (IMPLANTABLE CARDIOVERTER DEFIBRILLATOR)**

### **Indications**

ICD device that is generating inappropriate shocks (usually shocking sinus tachycardia or PSVT rather than ventricular tachycardia or ventricular fibrillation).

### **Precautions**

#### **USE STANDARD INFECTIOUS PRECAUTIONS**

- A. Patient may be understandably quite anxious and difficult to evaluate. The call will usually be for a defibrillator that "keeps going off." The majority of the time this will be because the patient is having frequent episodes of unstable ventricular tachycardia. Occasionally however, the device will be abnormally sensing a sinus or supraventricular tachycardia. Careful monitoring will allow the paramedic to differentiate these scenarios. It is inappropriate to "turn off" an ICD that is properly sensing and treating dysrhythmias.
- B. In a patient who is determined to have an ICD which is sensing and shocking inappropriately, full resuscitation equipment must be available before using the magnet to "turn off" the ICD.

### **Technique**

- A. Obtain full history including brand or name of device that has been implanted
- B. Apply O<sub>2</sub>, moderate flow (4-6 L/min)
- C. IV, NS, TKO
- D. Attach cardiac monitor
- E. Consider morphine 2-4 mg IV if patient uncomfortable.
- F. Consider diazepam 5 – 10 mg IV if patient anxious.
- G. Record rhythm and any defibrillations if possible.
- H. If rhythm is inappropriate for internal defibrillation, assure external defibrillator and intubation equipment are readily available. Use ICD magnet to inhibit device from sensing.
- I. Continue to monitor closely and transport to appropriate facility (preferably where the patient had the device implanted).
- J. Be prepared to defibrillate if ICD has been turned off. If necessary to defibrillate, anterior-posterior patch placement is preferred. Sternum-apex paddle or patch placement may damage lead wires from ICD.

### **Complications**

- A. Since some devices react differently to the magnet, it is important to be sure which device has been implanted. The device may still be functional though you think you have turned it off. Most of these patients will have histories of documented ventricular fibrillation or tachycardia associated with sudden death or symptomatic sustained ventricular tachycardia. The patient and their family will usually be quite well educated on the device. They should have written material and may even have a magnet in the home.
- B. Once you have used the magnet to turn the device off, the patient is at your mercy for further care. Assure all ACLS equipment is available before turning the device off.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 197 of 304
---	-----------------------	--------------------------------

### **Special Notes**

- A. Patients will frequently be quite frantic if the device has fired several times. They will be most anxious for the paramedic to turn off the device. Use caution! If the device is firing appropriately you will be replacing a 5-10 joule internal shock for a 200-360 joule external shock. The patient will not be pleased with the change. Consider morphine or valium for sedation.
- B. The magnet will also effect pacemakers. Do not use over a pure pacemaker. Response is device specific. Consult base for direction.
- C. Touching the patient will not be deleterious to field personnel. CPR should continue normally if so indicated. ACLS protocols should also be followed as usual. Shocks can be delivered from ICD and external devices if so indicated without effect on the ICD (the wires, however, may still be damaged by the shock - try to avoid). Monitor the patient and watch the rhythm – treat per dysrhythmia protocols.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 198 of 304
---	-----------------------	--------------------------------

## **IMPEDENCE THRESHOLD AIRWAY DEVICE IN CPR (ResQPOD)**

### **Indications**

Recent evidence suggests that enhancement of negative pressure during cardiopulmonary resuscitation (CPR) enhances coronary perfusion pressures and blood flow. This may lead to a greater number of patients experiencing a Return of Spontaneous Circulation (ROSC). This may, conceivably lead to higher number of patients surviving to hospital discharge. The Impedence Threshold Device (ITD) or ResQPOD accomplishes the goal of increasing the negative pressure between compressions during CPR.

### **Technique**

- A. Apply the ResQPOD ITD using a simple facemask and oral airway at the earliest possible opportunity (ideally just before the first chest compressions).
- B. Maintain a tight facemask seal at all times during chest compressions (Use headstrap with single rescuer).
- C. Use a bag-valve-mask (BVM) ventilator to provide ventilation.
- D. Use one handed squeeze for one second (until chest rises) to ventilate.
- E. Use a ratio of 30 compressions to 2 ventilations with facemask, or continuous compressions when using endotracheal tube, Combitube or LMA.
- F. Rotate rescuer doing chest compressions every 2-3 minutes.
- G. Compress at a rate of 100/min and a depth of 1.5 – 2”, with full recoil of the chest.
- H. Use ventilation timing lights when ventilating with endotracheal tube, Combitube or LMA.
- I. Do not interrupt CPR unless absolutely necessary.
- J. Package the ResQPOD already assembled with BVM. Do not delay chest compressions if ResQPOD is not ready. Begin chest compressions with full recoil of chest as soon as possible.
- K. Endotracheal intubation is the preferred airway.

### **Special Notes**

- A. Do not use ResQPOD timing lights during CPR with facemask; follow compression to ventilation ratio of 30:2.
- B. **If the patient has a return of pulse, the ResQPOD should be immediately discontinued. If the patient re-arrests at any point, the ResQPOD should be re-applied.**
- C. Interruption of chest compressions is detrimental and should be avoided as much as possible.
- D. Timing lights: When an endotracheal tube, Combitube or LMA is inserted, move ResQPOD from the facemask to the ventilation port on the tube. Begin continuous chest compressions at a rate of 100/min. Turn on ResQPOD timing lights and ventilate in rhythm with the timing light.
- E. Not recommended for use on patients less than 12 years of age.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 199 of 304
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## INTRASOSEOUS CANNULATION

### Indications

- A. When immediate vascular access is required for emergent administration of medications or fluids, and IV access is not rapidly obtainable.
- B. Intraosseous equipment is not intended for prophylactic access; it is only for critical immediate need!

### Contraindications

- A. Fracture of the bone selected for IO infusion (consider alternate site)
- B. Excessive tissue at insertion site with the absence of anatomical landmarks (consider alternate site)
- C. Previous significant orthopedic procedures (IO within 24 hours, prosthesis - consider alternate sites)
- D. Infection at the site selected for insertion (consider alternate site)

### Insertion Site Options

(approved for use by FDA)

- A. **Proximal Tibia** (primary site for insertion)
  - 1. Patients  $\geq$  40 Kg: Two finger widths below patella is the tibial tuberosity. The insertion site is approximately one finger width **medial** to the tibial tuberosity along the flat aspect of the medial tibia.
  - 2. Patients 3–39 Kg: Two finger widths below patella is the tibial tuberosity. The insertion site is approximately one finger width **distal** to the tibial tuberosity along the flat aspect of the medial tibia.
- B. **Distal Tibia** (secondary site for insertion)
  - 1. Patients  $\geq$  40 Kg: If for some reason the proximal tibia is not useable due to patient size, prosthetic knee joints, etc. you may use the distal tibia site, which is **two finger widths proximal to the medial malleolus**, along the flat aspect of the medial distal tibia.
  - 2. Patients 3–39 Kg: If for some reason the proximal tibia is not accessible, you may use the distal tibia site, which is **one finger width proximal to the medial malleolus**, along the flat aspect of the medial distal tibia.
- C. **Humeral Head** (secondary site for insertion)
  - 1. All patients  $>$  3Kg: If there is significant trauma to both lower extremities, or lower extremities are otherwise not accessible, this site may be utilized.

### Administration

- A. Locate appropriate FDA-approved insertion site (*Proximal Tibia, Distal Tibia, or Proximal Humerus*)
- B. Prepare insertion site using aseptic technique
- C. Prepare all needed equipment
- D. Prime extension tubing with 2% lidocaine: 0.5 mg/Kg dosage for all patients who do not have a known contraindication to its use.
- E. Stabilize site and insert appropriate needle set; *adult vs. pediatric vs. large adult*

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 200 of 304
---	-----------------------	--------------------------------

- F. Place the needle set following equipment manufacturer guidelines, then manually stabilize catheter hub
- G. Remove stylet from catheter, place stylet in shuttle or approved sharps container
- H. Confirm placement
- I. Connect lidocaine primed extension tubing.
- J. **Slowly** administer appropriate dose of Lidocaine IO to patient. (Over 30 seconds if patient is conscious)
- K. Allow 60 seconds for the lidocaine to have anesthetic effect.
- L. Secure tubing while allowing lidocaine to take effect
- M. **Rapidly** flush catheter with at least 10 ml normal saline under strong pressure, and observe site for signs of extravasation. (localized swelling, etc.)
- N. Begin infusion utilizing pressure (syringe bolus, for pediatrics, or a pressure bag for adults) for continuous infusions where applicable
- O. Monitor IO site and patient condition – Remove catheter within 24 hours

### **Side effects and special notes**

#### **Flow rate**

- A. Due to the anatomy of the IO space, flow rates will be slower than those achieved with an IV catheter.
- B. Ensure RAPID SYRINGE FLUSH prior to infusion NO FLUSH = NO FLOW
- C. To improve continuous infusion flow rates always use a syringe, pressure bag or infusion pump

#### **Pain**

- A. Insertion of the IO needle in conscious patients has been noted to cause mild to moderate discomfort (usually no more painful than a large bore IV). However, IO **Infusion under pressure** in conscious patients has been noted to cause severe discomfort.
- B. Prior to IO syringe bolus (flush) or continuous infusion in alert patients, remember to SLOWLY administer Lidocaine 2% 0.5 mg/Kg through the extension tubing.
- C. In patients allergic to lidocaine, flush instead with 10 ml of saline, and use analgesics to manage pain due to the infusion. This will not be as effective as normal lidocaine anesthesia however, which should be used whenever possible.
- D. Slowing the amount of infusion pressure also will decrease the amount of pain.

#### **Humeral Site use**

- A. Due to differences in adipose and muscle tissue depth, it is recommended that the extended length needle should be used.
- B. After placement in the humeral head, it is strongly recommended that the entire arm should be immobilized (in the position of diagram for locating landmarks) to ensure that the IO needle does not become dislodged by patient movement.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 201 of 304
---	-----------------------	--------------------------------

## **MEDICATION ADMINISTRATION**

### **Indications**

Illness or injury which requires medication to improve or maintain the patient's condition

### **Precautions**

#### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Certain medications can be administered via one route only, others via several. If you are uncertain about the drug - check with base.
- B. Make certain that the medication you want to give is the one in your hand. Always double check medication and dose before administration.
- C. IM and SQ routes are unpredictable – medications are absorbed erratically via these routes and may not be absorbed at all if the patient is seriously ill and severely vasoconstricted. The IV route should be used almost exclusively in the field.

### **Technique**

- A. Use syringe just large enough to hold appropriate quantity of medication (or use prefilled syringe).
- B. Attach large gauge needle (19-21 gauge) to syringe.
- C. Break ampule or cleanse multi-dose vial with alcohol.
- D. Using sterile technique and filter, draw medication into syringe.
- E. Change needles to small gauge (21 gauge or smaller) for IM or SQ.
- F. Medications should be checked at least 3 times before administration (out of the bag, out of the box, just prior to administration).

### **INTRAVENOUS INJECTION TECHNIQUE**

- A. Use needleless system, or use needle appropriate for viscosity of fluid injected. Glucose requires large gauge needle (19 g). Most medications, 20 gauge is appropriate.
- B. Cleanse IV tubing injection site with alcohol.
- C. Check medication in hand – confirm medication, dose, and amount.
- D. Eject air from syringe.
- E. Insert needle into injection site.
- F. Pinch IV tubing closed between bag and needle.
- G. Inject at a rate which is appropriate for the medication.
- H. Withdraw needle and release tubing to restore flow.
- I. Record medication given, dose, amount, time, and any observed response.

### **INTRAMUSCULAR INJECTION TECHNIQUE**

- A. Use long 21-22 gauge needle (1-1.5").
- B. Check medication in hand - confirm medication, dose and amount.
- C. Select injection site (usually deltoid, but may be upper outer quadrant of gluteus if more convenient).
- D. Cleanse site.
- E. Eject air from syringe.
- F. Stretch skin over injection site.
- G. Insert needle through skin into muscle, aspirate and, if no blood return, inject medication.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 202 of 304
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- H. Remove needle and put pressure over injection site with sterile swab.
- I. Record medication given, dose, amount, and time.

### **SUBCUTANEOUS INJECTION TECHNIQUE**

- A. Use 25 gauge needle 5/8" length for most subcutaneous injections.
- B. Check medication in hand – confirm medication, dose, and amount.
- C. Select injection site (usually just distal and posterior to deltoid).
- D. Cleanse site.
- E. Eject air from syringe.
- F. Pinch skin.
- G. Insert needle perpendicularly to hilt (5/8" only).
- H. Aspirate and, if there is no blood return, inject medication.
- I. Remove needle and put pressure over injection site with sterile swab.
- J. Record medication given, dose, amount, and time.

### **NEBULIZATION TECHNIQUE**

- A. Use hand-held nebulizer with mouthpiece (or mask for patient unable to hold mouthpiece).
- B. Check medication in hand. Confirm medication, dose, and amount.
- C. Draw up dose of medication in syringe or dropper – inject into nebulizer chamber. Add unit dose directly.
- D. Add diluent, if needed (usually water or NS) in appropriate amount.
- E. Attach to O2 tubing and set at 6-8 L/min (sufficient to produce good vaporization).
- F. Administer for approx 5 minutes, until solution gone from chamber.
- G. Record medication given, dose, amount, and time.

### **OCULAR TECHNIQUE**

- A. Perform hand hygiene.
- B. Check medication in hand – confirm medication, dose, and amount.
- C. Hold 4x4 under lower lid margin to absorb excess moisture after drop instillation.
- D. Ask the patient to look up while you gently pull down on the lower lid.
- E. Hold the dropper approximately 2 cm above the eye and allow the drop to fall into the lower conjunctival sac.
- F. Ask patient to close the eye and then remove excess moisture.

### **INTRANASAL TECHNIQUE**

- A. Check medication in hand – confirm medication, dose, and amount.
- B. Have patient in a supine position with head tilted back so that opening of nare is near-horizontal.
- C. Administer the medication into the nare and allow sufficient time for the medication to be absorbed before changing the patient's position.

### **INTRAOSSEOUS TECHNIQUE**

- A. Prepare medication to be administered.
- B. Check medication in hand – confirm medication, dose, and amount.
- C. Inject into port on intraosseous line, or . . .

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 203 of 304</p>
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- D. Remove needle from syringe, inject directly into intraosseous needle.
- E. Record medication given, dose, amount, and time.

**Complications**

- A. Local extravasation during IV medication injection, particularly with calcium or dextrose, may cause tissue necrosis. Watch carefully and be ready to stop injection immediately.
- B. Allergic and anaphylactic reactions occur more rapidly with IV injections, but may occur with medication administered by any route.
- C. Too rapid IV injection can cause untoward side effects. For example, diazepam can cause apnea and epinephrine can cause asystole or severe hypertension.
- D. IM or SQ injection causes uncertain medication levels over time. Later treatment may be jeopardized because of slow release and later effects of medication given hours before.

**Special Notes**

- A. Several medications are carried in different concentrations in an emergency medical kit. Be sure you are using the correct concentration! Epinephrine 1:10,000 and 1:1,000 are the most common to confuse.
- B. Carry pediatric drugs in a separate area of the drug case.
- C. Endotracheal medication administration provides onset of drug effect almost as rapidly as with IV administration. The action is more sustained, though, so, for example, epinephrine given via ET tube is not repeated every 5 minutes as an IV dose is.
- D. Administration of medication rectally is probably only going to be used for children with status seizures in whom IV access may be very difficult. The effects are almost as rapid as IV and there is an equal chance for respiratory depression – be prepared to assist ventilation before administration of diazepam.
- E. Medications should be checked at least 3 times before administration (out of the bag, out of the box, just prior to administration).

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 204 of 304
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## **EYE IRRIGATION LENS**

### **Indications**

Eye irrigation lens allows for the continuous infusion of fluids to the eye(s) of a patient when irrigation is warranted due to chemical irritation and or burns which involve the eye.

### **Precautions**

#### **USE STANDARD INFECTIOUS PRECAUTIONS**

- A. Use only on an intact globe.
- B. The device can cause corneal abrasions if irrigation solution runs dry while the device is in contact with the globe.

### **Technique**

- A. Administer ophthalmic anesthetic as per protocol in affected eye.
- B. Follow manufacturer's recommendations for insertion and removal.

### **Special notes**

- A. Add a new bag of saline, or remove device, before the bag runs dry.
- B. Coach the patient to avoid blinking while the lens is in place.
- C. If only one eye is being irrigated, tilt head to keep the "runoff" from contaminating the unaffected eye.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 205 of 304
---	-----------------------	--------------------------------

## **NASOGASTRIC INTUBATION**

### **Indications**

Relief of gastric distention and GI contents removal if needed

### **Precautions**

#### **USE STANDARD INFECTIOUS PRECAUTIONS**

- A. Contraindicated with facial fractures or nasal bleeding.
- B. Contraindicated with potential for upper airway obstructions (foreign body, epiglottitis).
- C. If endotracheal tube is in place, cuff may need to be released before tube will pass through esophagus.

### **Technique**

Insert as per local training guidelines

### **Complications**

- A. Insertion into cranial vault in patients with cribriform plate fracture. Do not place in patients with suspected facial fractures.
- B. Tracheal intubation.
- C. Nasal trauma causing upper airway bleeding.
- D. Vomiting and aspiration of gastric contents, either during insertion or while in place, particularly if stomach not decompressed.

### **Special Notes**

- A. Tube not indicated if transit time short or contraindications present.
- B. There is little point in placing NG tube if it is allowed to clog or if no suction is applied. The tube overcomes the normal cardio-esophageal sphincter mechanism and allows reflux or regurgitation of stomach contents, so the patient must remain sitting or semi-upright.

**Vigorous bleeding from stomach will quickly clog tube. Be ready to irrigate and aspirate frequently.**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 206 of 304
---	-----------------------	--------------------------------

## **PAIN MANAGEMENT**

### **Purpose**

To effectively manage the pain and discomfort of patients in the prehospital environment

### **Overview**

The control of a patient's pain is one of the most useful and humane treatments that healthcare providers can perform. It is inhumane to leave a patient in significant pain when the control of that pain does not complicate the patient's condition or place the patient in danger.

### **Indications**

- A. Acute pain stemming from an isolated injury or identifiable medical condition.
- B. Pain associated with myocardial ischemia.

### **Precautions**

#### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Hemodynamically unstable patients should receive fentanyl in smaller incremental doses.
- B. Medications may not always be necessary; Pain may be managed in another manner such as ice, elevation and splinting.

### **Technique**

- A. All patients receiving intravenous analgesic medications must be placed on supplemental oxygen, & have their SpO2 constantly monitored
- B. Patients 2-15 years old
  - 1. Morphine – 0.1 mg/kg IV. May repeat every 5 minutes to a total of 0.2 mg/kg.
  - 2. Fentanyl – 0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order).
  - 3. Diazepam – 0.2 mg/kg IV (max. single dose 5 mg) for muscle spasm in addition to analgesic. May use other equivalent benzodiazepine.
- C. Patients > 15 years old
  - 1. Morphine – 2-4 mg IV. May repeat every 5 minutes to a total of 0.2 mg/kg
  - 2. Fentanyl – 0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order)
  - 3. Diazepam – 2-5 mg IV (2.5 mg max. for >55yo) for muscle spasm in addition to analgesic. May repeat once in 10 minutes. May use other equivalent benzodiazepine.

### **Special Notes**

- A. Variations in the above require direct physician approval.
- B. Remember that the goal of analgesic therapy is to alleviate pain; however, proper attention must be paid to the well being of the patient's respiratory and hemodynamic status, as well as, the appropriate evaluation of the patient after the administration of medications.
- C. The provision of analgesics to patients who are general surgical candidates is controversial. Use minimal doses in patients with abdominal pain.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 207 of 304
---	-----------------------	--------------------------------

## PERIPHERAL IV LINE INSERTION

### Indications

- A. Administer fluids for volume expansion.
- B. Administer medications.

### Precautions

#### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Do not start IVs distal to a fracture site or through skin damaged with more than erythema or superficial abrasion.
- B. IVs started in the field are typically started under less than ideal conditions, and will be changed in the hospital.
- C. Make certain the IV solution in hand is the correct one. If venous access is only required as a precaution or for drug administration, consider saline lock rather than risk inadvertent fluid administration.
- D. Restrict IV attempts to one or two per provider.

### Technique

#### FOLLOW LOCAL EDUCATIONAL GUIDELINES

#### **EXTREMITY**

1. Explain the procedure to the patient.
2. Connect tubing to IV solution bag.
3. Fill drip chamber 1/2 full by squeezing and purge air from line
4. Tear sufficient tape to anchor IV in place.
5. Apply tourniquet proximal to proposed site, or use blood pressure cuff blown up to 40 mm Hg.
6. Scrub insertion site. (Betadine vs. alcohol is less important than vigor.)
7. Do not palpate, unless necessary, after prep. If you must palpate, prep your gloved finger.
8. Hold vein in place by applying gentle traction on vein distal to point of entry.
9. Puncture the skin with the bevel of the needle upward about 0.5 to 1 cm from the vein and enter the vein from the side or from above.
10. Note blood return and advance the catheter either over or through the needle (depending on type).
11. Remove needle and connect tubing. Note: blood for laboratory work may be drawn with syringe before connecting tubing. Assure proper disposal of "sharps."
12. Release tourniquet.
13. Open IV tubing clamp full to check flow and placement, then slow rate to TKO or as directed.
14. Cover puncture site. Secure tubing with tape, making sure of at least one 180 degree turn in the tubing to be sure any traction on the tubing is not transmitted to the cannula itself.
15. Anchor with arm board or splint as needed to minimize chance of losing line with movement.
16. Recheck to be sure IV rate is as desired, and monitor.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 208 of 304</p>
--	-------------------------------	---

### **EXTERNAL JUGULAR VEIN**

1. Explain the procedure to the patient.
2. Connect tubing to IV solution bag.
3. Fill drip chamber one-half full by squeezing and purge air from line.
4. Tear sufficient tape to anchor IV in place.
5. Position the patient – supine, head down (this may not be necessary or desirable if congestive heart failure or respiratory distress present). Turn patient's head to opposite side from procedure.
6. Expose vein by having patient bear down if possible, and "tourniquet" vein with finger pressure just above clavicle.
7. Scrub insertion site. (Betadine vs. alcohol is less important than vigor.)
8. Do not palpate, unless necessary, after prep. If you must palpate, prep your gloved finger.
9. Align the cannula in the direction of the vein, with the point aimed toward the shoulder on the same side.
10. Puncture skin over vein first, then puncture vein itself. Use other hand to traction vein near clavicle to prevent rolling.
11. Attach syringe and aspirate if pressure in vein not sufficient to give flash-back. Advance cannula well into vein once it is penetrated. Attach IV tubing. Assure proper disposal of "sharps."
12. Open IV tubing clamp full to check flow and placement, then slow rate to TKO or as directed.
13. Cover puncture site. Secure tubing with tape, making sure of at least one 180 degree turn in the tubing to be sure any traction on the tubing is not transmitted to the cannula itself.
14. Recheck to be sure IV rate is as desired, and monitor.

### **SCALP VEIN**

1. Connect tubing to IV solution.
2. Fill microdrip chamber one-half full by squeezing and purge air from line.
3. Tear sufficient tape to secure butterfly once in place.
4. Select a 23-25 gauge butterfly and a 1-2 ml syringe filled with 1 ml saline.
5. Place large rubber band or tourniquet around the infant's head above the ears and across top of forehead.
6. Locate vessel. (Frequently just anterior and superior to ear.)
7. Shave an area large enough to not only expose the vessel(s) but to allow for adequate taping.
8. Palpate the vessel to assure it is venous and has no pulsations.
9. Scrub insertion site. (Betadine vs. alcohol is less important than vigor.)
10. Puncture the skin approximately 0.5 cm from the vessel to be cannulated and aim in the direction of blood flow (usually toward the neck or face).
11. Ensure free flow of blood, then attach syringe, release the tourniquet and inject slowly 0.5 ml of saline. If the needle is in good position the solution will flow readily. The syringe may then be replaced with IV tubing. If the needle has

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 209 of 304</p>
---	-------------------------------	---

dislodged, a wheal will indicate poor placement and another site must be chosen. Assure proper disposal of "sharps."

12. Cover puncture site and tape securely. Cotton balls or gauze may be needed to support hub to keep needle in line with vein for free flow.
13. Tape additional loop of tubing at a distance to absorb tension.
14. Recheck to be sure IV rate is as desired, and monitor.

### **SALINE LOCK**

1. Explain the procedure to the patient.
2. Tear sufficient tape to anchor lock in place.
3. Select an appropriate sized catheter and fill a 10 ml syringe with 10 ml saline.
4. Apply tourniquet proximal to proposed site, or use blood pressure cuff blown up to 40 mm Hg.
5. Scrub insertion site. (Betadine vs. alcohol is less important than vigor.)
6. Do not palpate, unless necessary, after prep. If you must palpate, prep your gloved finger.
7. Hold vein in place by applying gentle traction on vein distal to point of entry.
8. Puncture the skin with the bevel of the needle upward about 0.5 to 1 cm from the vein and enter the vein from the side or from above.
9. Note blood return and advance the catheter either over or through the needle (depending on type). Assure proper disposal of "sharps."
10. Release tourniquet.
11. Flush catheter with 10 ml saline to assure good position.
12. Cover puncture site.

### **Complications**

- A. Pyrogenic reactions due to contaminated fluids become evident in about 30 minutes after starting the IV. Patient will develop fever, chills, nausea, vomiting, headache, or general malaise. If observed, stop and remove IV immediately. Save the solution for culturing.
- B. Local – hematoma formation, infection, thrombosis, phlebitis. NOTE: The incidence of phlebitis is particularly high in the leg. Avoid use of lower extremity if possible.
- C. Systemic – sepsis, catheter fragment embolus, or fiber embolus from IV solution.

### **Special Notes**

- A. Antecubital veins are useful access sites for patients in shock, but otherwise, avoid areas near joints (or splint well!).
- B. The point between the junctions of two veins is more stable and often easier to use.
- C. Start distally, and if successive attempts are necessary, you will be able to make more proximal attempts on the same vein without extravasating IV fluid.
- D. In difficult situations, do not forget "butterflies." They are often easier and may be better than no line at all.
- E. Venipuncture itself is seldom morbid. The excess fluids inadvertently run in when nobody is watching can be fatal!
- F. The most difficult problem with IV insertion is to know when to try and when to stop trying. Valuable time is often wasted attempting IVs when a critical patient requires

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 210 of 304
---	-----------------------	--------------------------------

blood. IV solutions may "buy time," but they frequently lose time instead. Generally, one attempt at the scene may be worthwhile; other attempts should be en route.

- G. Saline locks are becoming increasingly popular in the world of "cost containment". Use also allows a patient to be unencumbered by trailing IV lines. This may be particularly useful in situations where there is an awkward extrication (narrow hallways and stairs) and inclement weather where fluid can freeze in IV line while loading. The greatest risk is establishing an inadequate line that is unrecognized. The saline flush of 10 ml will usually be sufficient to detect a line that is not patent, but don't hesitate to add additional fluid if necessary to detect a subcutaneous or inadequate cannulation.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 211 of 304
---	-----------------------	--------------------------------

## MEDICATION ADMINISTRATION

### **UTILIZING A PREEXISTING VASCULAR ACCESS DEVICE (PVAD)**

A preexisting vascular access device (PVAD) is an indwelling catheter or device that is placed into a central vein to provide vascular access for patients requiring long-term intravenous therapy or hemodialysis. These devices usually play an important role in the on-going treatment of a patient with a significant medical problem. With due regard, they may be used in an emergency situation by prehospital personnel to care for the patients immediate needs.

#### **Indications**

- A. When other vascular access is not readily available and the patient's condition requires immediate intravenous therapy.
- B. Hemodialysis fistulas should only be used in immediately life-threatening situations.

#### **Types of PVAD's**

External indwelling catheters/devices

*Broviac, Hickman, and related devices* - A silicone tube that is inserted into the distal vena cava or the right atrium, usually through the cephalic vein. The catheter enters the skin through an incision in the anterior chest. The line is kept heparinized and protected by an injectable cap.

*PICC line* - A peripherally inserted central catheter. Usually inserted into the right atrium via the antecubital vein.

Internal subcutaneous infusion ports

Require special equipment to access and should not be used without specific training.

Hemodialysis fistula

A surgically created arteriovenous connection used for hemodialysis. A subcutaneous fistula may be accessed in critical patients requiring immediate medication administration in life-threatening situations only.

#### **Precautions**

##### **USE STANDARD INFECTIOUS PRECAUTIONS**

- A. Catheters accessing right atrium increase risk of air embolus. Avoid air in syringe or line.
- B. Central access increase risk of infection. Use sterile technique.

#### **Technique**

- A. Discontinue any current intravenous solutions that are being administered via the PVAD.
- B. Use extreme caution when discontinuing a chemotherapy infusion - to minimize exposure.
- C. Apply clean gloves
- D. Prepare a 10 ml syringe with normal saline.
- E. Clean injection port with an alcohol swab
- F. Ensure that catheter is unclamped
- G. Slowly inject 5 ml of normal saline into the injection port. If resistance is met when trying to inject, re-clamp the catheter and do not use.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 212 of 304</p>
--	-------------------------------	---

- H. Aspirate. If no resistance is met, inject remaining 5 ml of normal saline into the catheter. If resistance is met, re-clamp catheter and do not use.
- I. Administer medications and/or IV solutions as indicated.
- J. Flush the line well after each medication administered. Administration of diazepam should always be followed by a flush of at least 10 ml of normal saline to prevent catheter damage.
- K. If resistance is encountered at any time discontinue the use of the site.

**Accessing a hemodialysis fistula**

- A. Prior to access, check site for bruits and thrills.
- B. Access fistula on venous side (side with the weaker thrill in a patient with a pulse).
- C. Inflate BP cuff around IV bag to just above the patient's systolic blood pressure to maintain flow of IV.
- D. If unsuccessful in accessing site, hold direct pressure over site for 10 minutes.

**Complications**

- A. Infection - Due to the location of the catheter, strict adherence to aseptic technique is crucial when using a PVAD.
- B. Air Embolism - The PVAD provides a direct line into the central circulation, therefore, you must be particularly careful about expelling air from syringes, not allowing IV bags to run dry, and not removing the injection cap from the catheter.
- C. Thrombosis - A blood clot within the vascular system can be caused by improper handling and maintenance of the PVAD. Always flush medications with at least 5 ml of saline.
- D. Catheter Damage - Should damage occur to the external catheter, clamp immediately between the skin exit site and the damaged area to prevent air embolism or blood loss. Don't use unpadding clamps that will again damage the catheter.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 213 of 304
---	-----------------------	--------------------------------

## RESTRAINT

### Indications

- A. A patient who needs to be transported for medical care, who is refusing transport or care, and who is incompetent to refuse.
- B. A person who appears to be mentally ill and who, as a result of such mental illness, appears to be an imminent danger to others or to himself or to be gravely disabled.
- C. Physician consult by phone or radio which confirms above judgments.

### Precautions

#### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Any attempt at restraint involves risk to patient and EMT or Paramedic. Do not attempt to restrain a patient without adequate assistance.
- B. Physical restraints are a last resort. All possible means of verbal persuasion should be attempted first.
- C. A patient who is alert, oriented, aware of his condition, and capable of understanding the consequences of his refusal is entitled to refuse treatment. He may not be restrained and treated against his will. (Review consent guidelines and confer with physician if in doubt.)
- D. If there is a significant chance of the patient vomiting (e.g., intoxicants, withdrawal states), do not restrain in supine position, but rather in lateral position to decrease risk of aspiration.

### Techniques

- A. Determine that patient's medical or mental condition requires ambulance transport to the emergency department AND that patient lacks decision-making capacity, OR that there is a basis for police or mental health hold.
- B. Obtain adequate manpower for assistance.
- C. Treat the patient with respect.
- D. Organize your help in advance. Assign at least one person to each limb. A fifth person can coordinate the procedure.
- E. Have all equipment ready.
- F. Equipment must be durable and in good condition to avoid tearing or breaking with resultant injury to patient or rescuers.
- G. Inform the patient of your need to restrain him. Explain the procedure to the patient.
- H. Restrain arms and legs. Avoid body restraints as they may result in strangulation.
- I. Reassure patient; remind him that you are there to assist him in getting care.
- J. Check restraints as soon as applied and every 10 minutes thereafter to ensure no injury to extremities.
- K. Pad restraints as necessary.
- L. Paper face masks or oxygen masks (with adequate oxygen/air supply) may be useful to control spitting or biting. Tape mask over nose and mouth. Spit socks are particularly helpful.
- M. Once in restraints – do not leave the patient at any time.
- N. Remove restrains only with sufficient personnel available to control patient – generally, only in the hospital.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 214 of 304
---	-----------------------	--------------------------------

- O. Document indication for restraints, type of restraints, monitoring of peripheral circulation and sensation during transport, and condition on arrival at emergency department.

### **Complications**

- A. Radial nerve palsy (sensory loss on hand) can result from pinching of the nerve by hard restraints over the wrist prominences.
- B. Aspiration can occur if patient is restrained on his back and cannot protect his own airway.
- C. Medical causes for combativeness, if overlooked, may result in further injury to patient or inappropriate placement. Do not forget the medical differential of altered mental states – hypoglycemia, hypoxia, stroke, hyperthermia, hypothermia, or drug ingestion.
- D. Deterioration may cause your patient to "calm down." Be sure you are not falsely reassured.

### **Special Notes**

- A. Use with caution in patients with extremity injuries.
- B. Written and verbal reports must completely document the necessity for the use of physical restraints.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 215 of 304
---	-----------------------	--------------------------------

## **SPLINTING: AXIAL**

### **Indications**

- A. Pain, swelling or deformity of neck or back which may be due to fracture, dislocation, or ligamentous instability.
- B. Neurologic deficit which might be due to spine injury.
- C. Prevention of neurologic deficit or further deficit in patients with suspected spine injury or instability.
- D. In all trauma victims who are unconscious or with impaired consciousness due to head injury or drug ingestion, to protect against damage or further damage in patients where injury to the spine cannot be ruled out by accurate exam or history.
- E. Any patient with significant mechanism of injury and/or with head or neck injury and/or any distracting injury or concerns.

### **Precautions**

#### **USE STANDARD INFECTIOUS PRECAUTIONS**

- A. All patients with significant head trauma should be immobilized because of the potential for unrecognized coexistent neck trauma.
- B. Perform and document complete neurologic exam prior to movement if at all possible. Document after your splinting is complete.

### **Cervical Splinting Technique**

- A. Apply following primary assessment if indicated. Use assistant to maintain cervical stabilization while completing primary survey.
- B. Use two persons to apply splint if at all possible.
- C. Have assistant apply gentle continuous traction in neutral axis of spine. Do not use force to straighten.
- D. Advise patient of procedure and purpose before and during application.
- E. Immobilize the cervical spine with a semi-rigid or rigid Philadelphia collar.
- F. Use long spine board, short board or KED (or similar device) to support patient as situation dictates.
- G. Pad behind head in adults to maintain anatomically neutral position. Pad under the torso to maintain neutral position in children.
- H. Use tape, straps, or both to secure patient effectively and allow turning as a unit for airway control. Secure torso first, then head and neck, extremities last.
- I. Request assistant to monitor airway and security of immobilization.

### **Spine Immobilization Technique**

- A. Splint cervical spine with rigid collar following primary survey.
- B. Complete secondary survey and splint fractures prior to movement of patient when possible.
- C. Document neurologic findings.
- D. In a sitting patient, use short board, KED, or similar device for extrication
  - 1. Slide short board behind patient.
  - 2. Apply thigh straps snugly as close to groin as possible.
  - 3. Apply shoulder straps.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 216 of 304
---	-----------------------	--------------------------------

4. Use padding as needed to keep neck in cervical collar in a neutral position.
  5. Secure head to board with tape or cloths.
- E. Use long board for supine patients or sitting patients after short board, KED or similar device applied
1. Logroll or lift patient as a unit to board. Apply continuous cervical stabilization during movement. One person should protect neck in collar. Do not use force to straighten spine.
  2. Release leg straps if short board, KED, or similar device used.
  3. Use padding as needed behind knees to support a neutral axis under small of back, neck and knees.
  4. Secure trunk to long spine board.
  5. Pad behind the head as needed to maintain anatomically neutral position, pad under torso for pediatric patients.
  6. Use rolls, or blocks and tape to secure neck.
  7. Apply straps or tape to secure thighs, and lower legs to allow turning as a unit in case of vomiting or airway difficulty.
- F. Reassess patient status, particularly airway and neurologic findings.
- G. Assign assistant to monitor airway and neck immobilization.

### **Complications**

- A. Vomiting is common in head/spine injured patients. Your splinting must be good enough to allow turning of the patient for airway protection.
- B. Cord injury with neurologic deficit may be accompanied by neurogenic shock. Elevate foot of long board 10-12" or prop legs on blankets and secure with tape. Watch also for the more dangerous hypovolemia!
- C. It is easy to miss injuries below the level of a neurological deficit. Look carefully for abdominal and chest injuries, pelvis fractures, and extremity injuries without symptoms. With an injury and loss of sensation below T-8, there will be no guarding, rebound, or tenderness to clue you to internal abdominal injuries.

### **Special Notes**

- A. Not all accident victims require immobilization. Spinal immobilization is uncomfortable for the patient. It can cause back pain. It is time consuming for the prehospital care crew and does cause some risks for airway protection if not performed correctly. So which patients DO NOT require spinal immobilization?
  1. Patients under consideration for NO spinal immobilization must have no neck or back pain AND meet all five of the following NEXUS Criteria
    - a. No Alteration of Mental Status
    - b. No Apparent Intoxication
    - c. No Evident Distracting Injury Present (the presence of any injury suspicious for fracture and/or any injury associated with significant pain)
    - d. No Palpable Spinal Tenderness over any Vertebral Body
    - e. No Evidence of Focal Neurologic Deficit Present (no numbness, tingling or weakness in any one of the four extremities)
  2. Patients meeting all of the above criteria may be transported to the hospital without use of cervical collar and/or spine board immobilization.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 217 of 304
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- B. Language barriers and/or extremes of age and/or hearing deficits may make it impossible to assess for altered mental status. In such cases, spinal immobilization should be applied if there appears to be any potential for injury.
- C. Assessment of “intoxication” may vary between EMS providers. In such cases of disagreement, apply spinal immobilization if a mechanism for potential spinal injury exists.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 218 of 304
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## **PELVIC COMPRESSION DEVICE (EPCD)**

### **Indications**

- A. Pain, swelling or deformity near the pelvic girdle due to suspected pelvic fracture.
- B. In an unstable pelvic girdle injury – to reduce pain, limit bleeding at the site of injury, and prevent further injury to soft tissues, blood vessels or nerves.

### **Precautions**

#### **USE STANDARD INFECTIOUS PRECAUTIONS**

- A. Critically injured trauma victims should not be delayed in transport by a lengthy evaluation. Prevention of further damage may be accomplished by securing the patient to a spine board when other injuries demand prompt hospital treatment.
- B. The patient with altered level of consciousness from head injury or drug influences should be carefully examined because the patients' ability to recognize pain and injury is impaired.
- C. Make sure the obvious injury is also the only one. It is particularly easy to miss fractures proximal to the most visible one.
- D. In a stable patient in which no environmental hazard exists, pelvic splinting should be done prior to moving the patient.
- E. Never deliberately test for crepitus or instability or "rock" the pelvis.
- F. Non-indicated for suspected isolated hip fractures or dislocations.

### **Technique**

- A. Apply manual stabilization in position found.
- B. Expose the injured pelvis/hip area.
- C. Assess for distal circulation motion and sensory.
- D. Apply sterile dressings to all open wounds.
- E. Apply the PCD
  - 1. Supine Method
    - a. Slide the PCD under lumbar region until centered under the patient.
    - b. Pull gently downward into position under the buttock.
  - 2. Lift/Logroll Method
    - a. Position the PCD on longboard centered.
    - b. Lift or logroll the patient onto the device making sure the PCD stays in position.
    - c. Adjust the PCD as necessary to assure placement over the trochanters.
- F. Apply the compression strap(s).
- G. Reassess distal circulation, motion and sensory.

### **Complications**

- A. Continued bleeding not visible under splint.
- B. Delayed treatment of life-threatening injuries due to prolonged splinting procedures.

### **Special Notes**

- A. When in doubt and patient stable, splint. Do not be deceived by absence of deformity or disability.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 219 of 304
---	-----------------------	--------------------------------

- B. With sufficient mechanism for pelvic injury, consider spinal injury and other musculoskeletal trauma and hypovolemia.
- C. Unstable pelvic fractures should be moved on a split litter type device (if available) to provide lateral support and eliminate patient logroll which could shift bone fragments and cause additional hemorrhaging.
- D. When there is a suspected pelvic injury with a concurrent possible hip fracture, consider long-axis splint application and attachment of the anatomic pad as proximal as possible to prevent lower extremity external rotation to assist in stabilizing the hip area in conjunction with the PCD.
- E. The ideal static belt closure tension is not as important as the application of simultaneous circumferential compression without any rocking or turning of the patient. Smooth tightening of static closure until moderate resistance is experienced assures the PCD is providing circumferential compression, overcoming anatomic gravity effects, and stabilizing the pelvic girdle without over-tightening.
- F. When a commercial PCD is not available a bed sheet placed under the pelvis and tied securely anteriorly may be used.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 220 of 304
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## **SPLINTING: EXTREMITY**

### **Indications**

- A. Pain, swelling or deformity in extremity which may be due to fracture or dislocation.
- B. In an unstable extremity injury – to reduce pain, limit bleeding at the site of injury, and prevent further injury to soft tissues, blood vessels or nerves.

### **Precautions**

#### **USE STANDARD INFECTIOUS PRECAUTIONS**

- A. Critically injured trauma victims should not be delayed in transport by lengthy evaluation of possible noncritical extremity injuries. Prevention of further damage may be accomplished by securing the patient to a spine board when other injuries demand prompt hospital treatment.
- B. The patient with altered level of consciousness from head injury or drug influences should be carefully examined and conservatively treated because his ability to recognize pain and injury is impaired.
- C. Make sure the obvious injury is also the only one. It is particularly easy to miss fractures proximal to the most visible one.
- D. In a stable patient in which no environmental hazard exists, splinting should be done prior to moving the patient.
- E. Never deliberately test for crepitus or instability.
- F. Air splints are useful to control bleeding, but avoid over inflation and circulatory compromise. Temperature and altitude changes during transport will alter splint pressure.

#### **EXTREMITY SPLINTING TECHNIQUE**

- A. Check pulse and sensation distally prior to movement.
- B. Remove bracelets, watches, or other constricting bands prior to splint application. (Tape objects to patients.)
- C. Identify and dress open wounds. Note wounds which contain exposed bone or lie near fracture sites and may communicate with a fracture.
- D. Avoid unnecessary movement of fracture site to minimize pain and soft tissue damage.
- E. Choose splint to immobilize joint above and below injury. Pad rigid splints to prevent pressure injury to extremity.
- F. Apply gentle continuous traction to extremity and support to fracture site during splinting operation.
- G. Reduce angulated fractures, including open fractures, with gentle axial traction as needed to immobilize properly.
- H. Check distal pulses and sensation after reduction and splinting. Manipulate gently or replace in original position if adequate circulation and sensation is lost.

#### **TRACTION SPLINTING TECHNIQUE**

(for suspected femur fractures only)

- A. Use two persons for splint application procedure.
- B. Remove sock and shoe and check for distal pulse and sensation (unless you cannot protect exposed foot from weather, then just ask patient about sensation and observe movement).

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 221 of 304
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- C. Identify and dress open wounds and note exposed bone or wounds overlying fractures as potential communicating wounds.
- D. Measure splint length prior to application.
- E. Apply gentle axial traction with support to calf and fracture site, reducing angulation or open fractures as necessary for secure traction splinting.
- F. Position ischial pad under buttocks up against bony prominence (ischial tuberosity). Empty pockets if needed.
- G. Secure groin strap. Carefully!**
- H. Maintain continuous traction and support to fracture site throughout procedure.
- I. Adjust support straps to appropriate positions under leg.
- J. Apply ankle hitch and tighten traction until patient experiences improved comfort. (Movement at the fracture site will cause some pain, but if traction continues to cause increased pain, do not proceed. Splint and support leg in position of most comfort.)
- K. Secure support straps after traction properly adjusted.
- L. Recheck distal pulses and sensation.

### **Complications**

- A. Circulatory compromise from excessive constriction of limb.
- B. Continued bleeding not visible under splint.
- C. Pressure damage to skin and nerves from inadequate padding.
- D. Delayed treatment of life-threatening injuries due to prolonged splinting procedures.

### **Special Notes**

- A. Traction splints should only be used if the leg can be straightened easily and patient is comfortable with the traction device in place. Particularly with injuries about the hip and knee, forced application of traction device can cause increased pain and damage. If this occurs, do not use traction device but support leg with pillows, sandbags, or other support in position of most comfort and best neurovascular status.
- B. Traction technique described is most specific for Hare traction device. There are several devices available and slight modifications in application technique are needed. The principles should remain the same, however. It is always essential to become knowledgeable about your own equipment.
- C. When in doubt and patient stable, splint. Do not be deceived by absence of deformity or disability. Fractured limbs often retain some ability to function.
- D. Splinting body parts together can be a very effective way of immobilizing (e.g., arm-to-trunk or leg-to-leg). Padding will increase comfort. This method can be very useful in children when traction devices and premade splints do not fit.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 222 of 304
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## TENSION PNEUMOTHORAX DECOMPRESSION

### Philosophy

Tension pneumothorax is not only rare; it is an extremely difficult diagnosis to make in the field with any accuracy. The physical examination of the chest is notoriously unreliable in the freshly traumatized chest and the patient with chronic obstructive lung disease may well have dyspnea at rest, cyanosis, and absent breath sounds unilaterally or bilaterally without having even a simple pneumothorax, no less a tension pneumothorax. Probably the most helpful diagnostic sign is rapidly increasing air hunger in a cyanotic patient who has a history compatible with pneumothorax (e.g., someone kicked in the chest). The most common use of the procedure in the field is in the traumatized patient who has been intubated and rapidly becomes increasingly difficult to bag. This patient will need decompression immediately. This skill (diagnosis and technique) must be reviewed and practiced if it is to be ready on the rare occasion when it is indicated.

### Indications

- A. Patient with pneumothorax who requires air transport (with altitude changes).
- B. Increasing respiratory insufficiency in a susceptible patient
  - 1. Untreated spontaneous pneumothorax.
  - 2. CPR with PEA, increased difficulty bagging patient.
  - 3. Sucking chest wound which has been covered completely.
  - 4. Chest trauma with suspected pneumothorax.

### Precautions

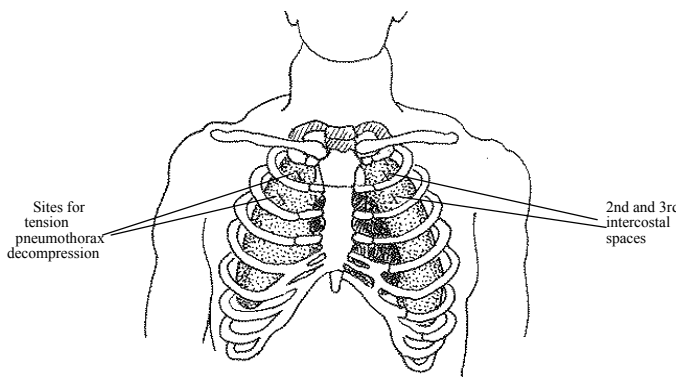
#### USE STANDARD INFECTIOUS PRECAUTIONS

- A. Classic physical findings are often not present. You must be suspicious in patients who may be susceptible. This is a rare but life-threatening diagnosis.
- B. Recognize the difference between the two types of pneumothorax
  - SIMPLE pneumothorax
    - 1. Respiratory distress (mild to severe).
    - 2. Chest pain.
    - 3. MAY have decreased or absent breath sounds on the side of the collapse (not necessarily!)
    - 4. Subcutaneous air if the cause is traumatic
  - TENSION pneumothorax
    - 5. Progressive respiratory distress.
    - 6. Dropping BP.
    - 7. "Drum-like" hyper expanded chest.
    - 8. Distended neck veins.
    - 9. General patient deterioration.
    - 10. If intubated, progressive difficulty in bagging.
    - 11. Tracheal shift is rarely present.
- C. Pneumothorax rarely presents with tension on the initial assessment. Be particularly suspicious with deterioration during transport and with patients requiring assisted ventilation.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 223 of 304</p>
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### **Technique**

- A. If covered sucking chest wound is present, remove the seal and allow chest pressures to equilibrate. May need no further treatment.
- B. Needle decompression (angiocath only)
  1. Expose the entire chest.
  2. Clean area for insertion vigorously – alcohol or Betadine.
  3. Attach 20 ml syringe or leave angiocath open.
  4. Insert angiocath into the pleural space by entering the chest in the second or third intercostal space in the mid-clavicular line. The catheter should be inserted on top of the rib so as to avoid the intercostal vessels and nerves which run below each rib.
  5. When tension is present, plunger will back out of syringe or an immediate hiss of air escaping will be heard. Some of the newer catheters will not allow air passage until the needle is withdrawn and the plastic hub as the only part remaining allows the air to escape. If there is no initial hiss – remove the needle and reevaluate. A second catheter may be needed with severe air leak.
  6. If no hiss or evidence of tension seen, remove angiocath and reassess reason for patient deterioration.
  7. If air under pressure is demonstrated, remove the needle trocar and advance the catheter.
  8. Tape in place.
  9. Connect to flutter valve if available. Otherwise, simply ventilate the patient.
- C. If patient deteriorates after needle decompression, be prepared to assist ventilation and continue hyper-oxygenating.



### **Complications**

- A. Creation of pneumothorax if none existed previously.
- B. Pulmonary edema from release of collapsed lung, particularly in spontaneous pneumothorax.
- C. Laceration of lung.
- D. Laceration of blood vessels – slide above rib (intercostal vessels run in groove under each rib).
- E. Infection – clean rapidly but vigorously, use sterile gloves if possible.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 224 of 304
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### **Special Notes**

- A. The procedure is very painful. It should never be performed unless the patient is in extremis. It is impossible to completely deaden the pleura. Rapid penetration of the pleura will be kindest for the patient.
- B. Sudden onset of chest pain and shortness of breath in a normal individual may be caused by a pneumothorax. These can also progress to a "tension" state, but rarely do so. The differential for respiratory distress, particularly in the COPD patient, is long. Field diagnosis is difficult. And the addition of a pneumothorax by inappropriate diagnosis can be fatal. Unless the patient is intubated with positive pressure ventilation, procedure should not be attempted.
- C. In CPR with PEA and possible tension pneumothorax, decompress both sides of chest (after intubation).

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 225 of 304
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# **CHAPTER 8**

## **PREHOSPITAL MEDICATIONS**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 226 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 227 of 304
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## INTRODUCTION TO PREHOSPITAL DRUGS

All care, in regard to the administration of medications, assessment, and performance of procedures, shall be provided in accordance with the practitioner's scope of practice, defined by the most recent version of the Colorado Board of Medical Examiners Rule 500. As such, specific care guidelines will not be delineated within these protocols, except to denote restrictions on the scope of practice. If allowed by Rule 500, we will expect the practitioners to follow appropriate guidelines.

### Basic prehospital drugs

- Albuterol
- Aspirin
- Charcoal
- Dextrose, oral preparations
- Oxygen

Assist patient with:

- epinephrine (Epi-Pen) or anaphylaxis kit
- Inhalers
- Nitroglycerin

Advanced drugs suitable for standing-order in some circumstances OR direct-order administration.

Adenosine	Influenza Virus Vaccine
Albuterol	Ipratropium Bromide
Amiodarone	IV solutions
Atropine	Lidocaine
Benzocaine	Lidocaine Viscous
Benzodiazepines	Magnesium sulfate
Calcium	Morphine
Charcoal	Naloxone
Dexamethasone	Ondansetron
Dextrose, IV preparations	Phenylephrine nasal spray
Diltiazem	Racemic Epinephrine
Diphenhydramine	Sodium bicarbonate (drowning, cardiac arrest)
Dopamine	Succinylcholine
Epinephrine	Tetanus-Diphtheria Vaccine
Etomidate	Topical Ophthalmic Anesthetics
Fentanyl	Tuberculin PPD
Furosemide	Vasopressin
Glucagon	Vecuronium Bromide
Haldol	Verapamil
Hepatitis B Vaccine	

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 228 of 304
---	-----------------------	--------------------------------

## **ADENOSINE (ADENOCARD)**

### **Pharmacology and actions**

Adenosine is a naturally occurring purine nucleoside. Adenosine slows conduction time through the AV node. This results in an interruption of AV–nodal reentry pathways. It can restore NSR in patients with PSVT.

### **Indications**

- A. PSVT. (Including PSVT associated with Wolff–Parkinson–White Syndrome or other accessory bypass tracts.)
- B. Tachycardia, uncertain etiology, to determine underlying dysrhythmia.

### **Precautions**

- A. Contraindicated in patients with second or third degree A–V block or sick sinus syndrome. Underlying blocks or conduction defects can be associated with prolonged sinus arrest when using adenosine.
- B. Adenosine has a very short half–life (< 10 seconds). If bolus administration is not rapid, followed by a fluid push, the drug may have no effect, simply because it has been metabolized.

### **Administration**

- A. **Adults**  
Initial dose – 6 mg rapid IV push, followed immediately by a saline bolus of 10–20 ml via separate syringe.  
Second dose, if necessary after 1–2 minutes – 12 mg rapid IV push followed by saline flush. This may be repeated once if necessary.
- B. **Pediatrics**  
Initial dose – 0.1 mg/kg rapid IV push (max 6 mg), followed immediately by a 3–5 ml saline flush.  
Second dose, if necessary after 1–2 minutes – 0.2 mg/kg rapid IV push, (max 12 mg) followed by saline flush.

### **Side effects and special notes**

- A. At the time of conversion many patients will have flushing, dyspnea, chest pain, or apprehension. These symptoms are transient, but can be frightening. Reassurance will be helpful, particularly in advance.
- B. The cardiac rhythm after administration of adenosine can undergo various dysrhythmias prior to converting to sinus rhythm. A brief period of asystole, bradycardia or transient ectopy is common.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 229 of 304
---	-----------------------	--------------------------------

## ALBUTEROL

### Pharmacology and actions

Albuterol is a relatively selective Beta2 adrenergic stimulator. The effects are predominantly on bronchial smooth muscle; however there are also  $\beta_2$  receptors in the heart muscle. Clinical effects most frequently include

- A. Bronchial dilatation, improvement in FEV1 and peak flow.
- B. Tachycardia.
- C. Peripheral vasodilatation.
- D. Hyper or hypotension possible.

### Indications

As a bronchodilator for asthma, and for reversible bronchospasm associated with bronchitis and emphysema (COPD).

### Precautions

- A. Use with caution in patients with history of cardiovascular disorders such as hypertension, CAD, CHF, or hyperthyroidism.
- B. May lower seizure threshold in susceptible patients.
- C. Patients over 40 should have cardiac rhythm monitored during treatment.
- D. Paradoxical bronchospasm has been reported as a response to this drug. If it appears the patient is getting worse – discontinue the treatment.

### Administration

- A. Available as premixed solution 0.083% albuterol or 0.83 mg/ml or 2.5 mg/inhalation treatment.
  - 1. **Adults** – administer by nebulizer 3 ml (2.5 mg for 2 yrs to adult).
  - 2. **For children under 2** – use half of premixed solution with 2 ml of saline.
- B. May repeat or even administer as a continuous nebulization during transport if necessary.

### Side effects and special notes

- A. Nervousness, tremors, tachycardia and nausea are frequent side effects.
- B. May produce hypertension, palpitations, angina, or dysrhythmias.
- C. Cardiac effects may be more pronounced in patients who are taking MAO inhibitors or tricyclic antidepressants.
- D. Basic prehospital care providers may be asked to assist with administration of the patient's inhaler. Contact base physician to assess the type of inhaler and whether appropriate for current condition.
- E. EMT–Basics may administer abuterol for asthma, and for reversible bronchospasm associated with bronchitis and emphysema (COPD) with a direct physician order.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 230 of 304
---	-----------------------	--------------------------------

## **AMIODARONE (CORDARONE)**

### **Pharmacology and actions**

Amiodarone is a complex, wide-spectrum medication which is typically categorized as a Class III antiarrhythmic due to its lengthening of the effective refractory period by prolongation of the action potential duration. However, it also demonstrates strong sodium channel antagonism, some calcium and potassium channel inhibition, and noncompetitive blockade of alpha and beta-adrenergic receptors. While the fact that this medication works through a variety of different mechanisms increases its effectiveness in treating dysrhythmias when other medications may be ineffective, this also increases the proarrhythmogenicity and side effect potential of the medication. Amiodarone is a pro-drug, which requires extensive hepatic metabolization in forming its pharmacologically active metabolite. Amiodarone is highly lipid soluble, widely distributed throughout the body, and undergoes a very slow elimination half-life (months) while being eliminated through the lacrimal glands, skin, and biliary system, rather than through the kidneys.

### **Indications**

- A. Ventricular fibrillation or pulseless ventricular tachycardia.
- B. Recurrent, hemodynamically unstable, ventricular tachycardia unresponsive to cardioversion.

### **Precautions**

- A. Although amiodarone may be effective on a variety of different dysrhythmias, due to the potential complications associated with this medication, it will only be considered for use in the patient who is experiencing recurrent, lethal, ventricular dysrhythmias, as described above.
- B. Amiodarone causes prolongation of the QT interval, and may induce Torsades de Pointes. This effect may be exacerbated in the presence of other medications that cause QT prolongation (i.e., procainamide, etc).
- C. Hypotension may develop, however, this effect is primarily seen with multiple and higher doses of the medication given over a period of hours.

### **Administration**

- A. **Adult Cardiac Arrest** – Dilute 300 mg of amiodarone in 20–30 ml of NS or D5W and administer IV/IO push. If no response within 3–5 minutes, administer 150 mg of amiodarone IV/IO push.
- B. **Adult Unstable V-Tach** – Administer 150 mg over 10 minutes. This dose may be repeated after 10 minutes, if the first dose was not effective.
- C. **Pediatric Cardiac Arrest** – 5 mg/kg (max 300 mg) IV/IO bolus. You may repeat this twice (total of 15 mg/kg), at 5 minute intervals, if needed.
- D. **Pediatric Unstable V-Tach** – Administer 5 mg/kg over 20 minutes. Do not repeat.

### **Side effects and special notes**

If the patient develops Torsades de Pointes, treat with catecholamines and magnesium.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 231 of 304
---	-----------------------	--------------------------------

## **ASPIRIN (ACETYLSALICYLIC ACID)**

### **Pharmacology and actions**

Aspirin is an NSAID which exhibits analgesic, anti-inflammatory, antipyretic, and anti-thrombotic activity. Like the analgesic and anti-inflammatory effects, the effects of aspirin on platelets appear to be mainly associated with an inhibition of prostaglandin synthesis. Aspirin irreversibly inactivates the enzyme cyclooxygenase in circulating platelets. The inactivation of this enzyme is currently thought to prevent platelet synthesis of prostaglandin endoperoxides and thromboxane A<sub>2</sub>, compounds which induce platelet aggregation and constrict arterial smooth muscle. Platelet cyclooxygenase has been found to be inhibited by single oral aspirin doses of 80–300 mg.

The administration of aspirin to patients who can tolerate its use, during the acute phase of a myocardial infarction to prevent post-thrombolytic reocclusion, reinfarction, or death (“acute secondary prophylaxis”) is strongly supported.

### **Indications**

The field indication for aspirin use will be limited to the adult patient believed to be experiencing an acute myocardial infarction.

### **Precautions**

- A. Patients who have experienced urticaria, angioedema, bronchospasm, severe rhinitis, or shock with the use of aspirin, or other NSAID’s represent an absolute contraindication to the use of aspirin in the field.
- B. Patients who have a history of severe GI bleeding, asthma, CNS lesions, bleeding disorders, or anticoagulant use (i.e. Coumadin, Plavix, heparin, etc.) may represent a relative contraindication to a single dose of aspirin. Contact the receiving physician for orders.

### **Administration**

Two to four, 81 mg, chewable tablets should be administered by mouth.

### **Side effects and special notes**

- A. May cause gastric upset in especially sensitive individuals.
- B. May cause an increased risk of bleeding when combined with anticoagulants and thrombolytic agents.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 232 of 304
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## ATROPINE

### Pharmacology and actions

Atropine is a parasympathetic or cholinergic blocking agent. As such, it has the following effects

- A. Increases heart rate (by blocking vagal influences).
- B. Increases conduction through A–V node.
- C. Reduces motility and tone of GI tract.
- D. Reduces action and tone of urinary bladder (may cause urinary retention).
- E. Dilates pupils.

NOTE: This drug blocks cholinergic (vagal) influences already present. If there is little cholinergic stimulation present, effects will be minimal.

### Indications

- A. To counteract excessive vagal influences responsible for some bradysystolic and asystolic arrests.
- B. To increase heart rate in hemodynamically significant bradycardias.
- C. To improve conduction in 2nd and 3rd degree heart block or in pacemaker failure.
- D. As an antidote for some insecticide exposures (e.g., organophosphates) and nerve gases with symptoms of excess cholinergic stimulation: salivation, constricted pupils, bradycardia, tearing, diaphoresis, vomiting, and diarrhea.
- E. As an adjunct with RSI.

### Precautions

Bradycardias in the setting of an acute MI are common and may be beneficial. Do not treat unless there are signs of poor perfusion (low blood pressure, mental confusion). Chest pain could be due to an MI or to poor perfusion caused by the bradycardia itself.

People do well with chronic 2nd and 3rd degree block. Symptoms occur mainly with acute change. Treat the patient, not the rhythm.

Pediatric bradycardias are most commonly secondary to hypoxia. Correct the ventilation first. Treat the rate only if improved ventilation does not increase the rate.

Bradycardia in the trauma patient, as with the pediatric patient, is usually a result of underlying condition. It may be secondary to a cardiac contusion, or may be due to critical CNS, cardiac or respiratory decompensation. Treat the underlying cause!

### Administration

- A. Asystole
  - 1. **adult** – 1.0 mg IV, repeat in 3–5 minutes to total of 0.04 mg/kg.
  - 2. **pediatric** – 0.02 mg/kg per dose IV (minimum dose of 0.1 mg and a max of 1.0 mg in child, Max of 0.04 mg/kg in an adolescent).
- B. Symptomatic bradycardia
  - 1. **adult** – 0.5–1.0 mg IV, repeated if needed at 5 minute intervals to a heart rate of 60 or total of 0.04 mg/kg.
  - 2. **pediatric** – 0.02 mg/kg per dose IV.
- C. RSI in pediatric patients 0.02 mg/kg IV prior to succinylcholine.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 233 of 304
---	-----------------------	--------------------------------

- D. May be given via ET tube at double the dose.
- E. For symptomatic insecticide exposures: contact base or PCC for dosage (usually begin with 2 mg IV and titrate). Total required dose may be massive.

**Side effects and special notes**

- A. Remember in cardiac arrest situation that atropine dilates pupils.
- B. Atropine should not be administered in less than 0.5 mg dose for adults to prevent a parasympathomimetic response that would further slow the heart rate.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 234 of 304
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## **BENZOCAINE, 20% TOPICAL AEROSOL**

### **Pharmacology and actions**

Benzocaine is a local anesthetic of the ester type. It decreases the permeability of sodium ions in the neuronal membrane thereby blocking the initiation and conduction of nerve impulses. It is poorly absorbed after topical application, reducing the potential for systemic effect. Most frequent clinical effects include

- A. Topical anesthetic for the relief of mild skin conditions.
- B. Topical anesthetic for decreasing pharyngeal and tracheal reflexes when pharyngeal or nasal airways are in place.

### **Indications**

Topical anesthetic to reduce hyperactive pharyngeal and tracheal reflexes exacerbated by the placement of endotracheal or nasogastric tubes

### **Precautions**

- A. Contraindicated in patients with known allergy or hypersensitivity to Benzocaine.
- B. May cause burning or stinging. Discontinue use if erythema, itching, rash, or edema occurs.
- C. Do not use in infants under 2 year of age.
- D. Use with caution in pregnant women or nursing mothers.

### **Administration**

- A. Apply evenly to mucosal tissue in sprays of less than 1 second. May be repeated as necessary to suppress hyperactive reflexes.
- B. May apply to endotracheal or nasogastric tubes before insertion.

### **Side effects and special notes**

- A. Burning, stinging, pruritus, tenderness, erythema, rash, urticaria, and edema may occur.
- B. May compromise gag and carinal reflexes. Be prepared to manage the patient's airway.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 235 of 304
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## **BENZODIAZEPINES**

### **DIAZEPAM (Valium) LORAZEPAM (Ativan) MIDAZOLAM (Versed)**

#### **Pharmacology and actions**

Benzodiazepines work by enhancing the effect of the inhibitory neurotransmitter gamma-amino butyric acid (GABA) at GABA<sub>A</sub> receptors, resulting in a depressant effect on the central nervous system.

#### **Indications**

Seizures, Anxiety, Muscle Spasms, combative behavior. Premedication for medical procedures.

#### **Administration**

##### **Adult**

- Lorazepam 1 mg IV/IO or 2 mg IM; may repeat once in 10 minutes, or
- Midazolam 2 mg IV/IO/IM/Intranasal; may repeat once in 10 minutes, or
- Diazepam 2-5 mg IV/IO or 5 mg IM; may repeat once in 10 minutes.

##### **Pediatric**

- Lorazepam 0.1 mg/kg IV/IO/IM (single maximum dose 2 mg), or
- Midazolam 0.1 mg/kg IV/IO/IM or 0.2 mg/kg Intranasal (single maximum dose 6 mg), or
- Diazepam 0.2 mg/kg IV/IO or 0.5 mg/kg PR (single maximum dose 5 mg IV or 10 mg PR)

#### **Side effects and special notes**

- A. Amnesia
- B. Risk of side effects of benzodiazepines is greatest in the elderly.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 236 of 304
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## CALCIUM

### Pharmacology and actions

- A. Increases contractility of cardiac muscle.
- B. May increase ventricular automaticity and excitability.
- C. Decreases heart rate.
- D. Produces effects similar to and additive with those of digitalis.

### Indications

- A. Hypocalcaemia.
- B. Hyperkalemia.
- C. Hypermagnesemia.
- D. Calcium channel blocker toxicity.
- E. Hydrofluoric Acid burns (Calcium Gluconate)
- F. Hydrogen fluoride or other fluoride systemic toxicity

### Precautions

- A. Do not add to IV in rapid succession with sodium bicarbonate (precipitates calcium salt).
- B. In digitalized patients, additive effects may cause ventricular fibrillation or asystole.

### Administration

- A. Calcium chloride (10% solution) 1 ampule or prefilled syringe = 10 ml = 13.6 mEq calcium = 1000 mg calcium chloride.
  - 1. Adult dose – 10 mg/kg calcium chloride slow IV (7 ml 10% solution for 70 kg patient).
  - 2. Pediatric dose – 20 mg/kg calcium chloride (0.2 ml/kg) slow IV to a maximum of 2 ml.
- B. Calcium Gluconate (2.5–10%) commercially prepared, or mixed with water soluble lubricant. Apply topically to affected area.
- C. Other indications – See Haz Mat Chapter.

### Side effects and special notes

- A. If heart is beating, rapid administration of calcium salts can produce bradycardia or asystole.
- B. May increase cardiac irritability (PVCs), particularly in the presence of digitalis.
- C. Local infiltration into the subcutaneous tissue will cause tissue necrosis. Be sure the IV is secure.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 237 of 304
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## CHARCOAL

### Pharmacology and actions

Oral activated charcoal adsorbs drugs and chemicals on the surface of the charcoal particles. This adsorption is almost irreversible and prevents absorption and toxicity. Activated charcoal is produced by the destruction of various organic materials (wood, petroleum) then treated at high temperature with activating agents (steam or CO<sub>2</sub>) to increase its adsorptive capacity. Activation occurs by removing previously adsorbed materials and by reducing particle size, thereby increasing the surface area.

### Indications

- A. Toxic ingestion of chemicals (other than acids, alkalis or hydrocarbons).
- B. Overdose of medications (other than iron or lithium).

### Precautions

- A. Do not administer soon after ipecac since it may come up rather violently. It is very difficult to clean from clothing and surroundings.
- B. Do not administer to comatose patient; ABCs will take precedence in those patients.

### Administration

- A. **Adult** – 1 Gm/kg activated charcoal orally
- B. **Pediatric** – 1 Gm/kg activated charcoal orally (Direct Physician Order Only)

### Side effects and special notes

- A. Charcoal is inert with very few side effects, but may be constipating.
- B. Charcoal is useful in many ingestions. It is most effective when administered soon after the ingestion, but may still be effective many hours later.
- C. There are some ingestions that are not adsorbed by charcoal (iron, lithium, alcohols, and caustics). Contact base physician to discuss specific ingestions. Order for administration may also come from PCC if family has been in communication with them or PCC easier to contact at 800-222-1222.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 238 of 304
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## DEXAMETHASONE

### **Pharmacology and actions**

Dexamethasone is a steroid compound which inhibits inflammatory response of tissues injured from mechanical, chemical, infectious, inflammatory or other causes. It may lessen swelling in cells of the brain or spinal column after trauma or hypoxia. In patients with asthma, steroids stabilize cells, preventing release of histamines and other mediators of bronchospasm. Any improvement will occur hours, not minutes, after administration.

Note: Steroids have many complex effects, particularly when used over a period of time. A single dose probably does not have significant side effects.

### **Indications**

- A. Refractory asthma.
- B. Anaphylactic shock.

### **Contraindications**

Not indicated for acute spine and closed head injury patients.

### **Administration**

- A. **Adults:** 10 mg dexamethasone IV or IM.
- B. **Children:** 0.6 mg/kg IV or IM.

### **Side effects and special notes**

Dexamethasone, unlike most prehospital drugs, is not expected to have effects during the time of transport. Early use may be indicated to minimize the time delay between injury and in-hospital therapeutic effect.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 239 of 304
---	-----------------------	--------------------------------

## **DEXTROSE (Intravenous)**

### **Pharmacology and actions**

Glucose is the body's basic fuel. It produces most of the body's quick energy. Glucose use is regulated by insulin, which stimulates storage of excess glucose from the bloodstream, and by glucagon, which mobilizes stored glucose in the bloodstream.

### **Indications**

- A. Any illness or altered mental state in a known diabetic which might be caused by hypoglycemia.
- B. Unconscious patient when a history is unobtainable and hypoglycemia cannot be excluded.
- C. In patients with any focal neurologic deficit or altered state of consciousness and a blood glucose < 60 mg/dl.
- D. Patient with active seizure or cardiac arrest when history is unobtainable.
- E. Pediatric patients (less than 3) with signs of shock.
- F. Hypothermia, generalized.
- G. Any clinical condition of concern for hypoglycemia and blood glucose reading less than 60 mg/dl.

### **Precautions**

- A. Test 1–2 drops of blood prior to administration of dextrose.
- B. Extravasation of dextrose will cause necrosis of tissue. IV should be secure and free return of blood into the syringe or tubing should be checked 2–3 times during administration.

### **Administration**

- A. Test blood for glucose level.
- B. **Adult** – 50 ml ampule 50% dextrose (1 ml/kg) IV into secure vein if patient unable to tolerate oral fluids.
- C. **Pediatric** – 2 ml/kg 25% dextrose (dilute 50:50 with saline) into secure IV.
- D. **Neonates** – 5 ml/kg of 10% dextrose (dilute 1:5 with saline) into secure IV.
- E. Give 50% dextrose solution orally (or sugar plus juice, honey, molasses, syrup) if patient is awake.

### **Side effects and special notes**

- A. Dextrose is remarkably free of side effects for most patients and should be used whenever a question of hypoglycemia exists.
- B. In an unconscious patient, blood should be drawn for glucose determination and a drop should be tested. If results are low or equivocal, administer dextrose. Dextrose should be omitted only with a clear cut test reading over 100 mg/dl.
- C. Effect is delayed in elderly people with poor circulation or patients who have been hypoglycemic for a prolonged period of time.
- D. Do not draw blood for glucose determination from site proximal to an IV containing glucose or dextrose.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 240 of 304
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## **DEXTROSE (ORAL)**

### **Pharmacology and actions**

Raises the blood glucose level. Oral glucose may restore the level of sugar necessary for normal organ function, especially the brain.

### **Indications**

Patient with altered mental status who is poorly responsive or confused may be given oral glucose. Insure the patient's breathing is adequate and that the patient has the ability to swallow.

### **Precautions**

Contraindicated in an unconscious patient or in a patient who is unable to swallow. Aspiration of the glucose into the lungs could occur in such a patient.

### **Administration**

- A. Administer one tube gradually into the mouth. Tubes contain 15–30 grams of glucose.
- B. Squeeze oral glucose from tube onto a tongue depressor. Place the tongue depressor between the patient's cheek and gum. Alternatively, the glucose can be squeezed directly from the tube into the patient's mouth between the cheek and gum.

### **Side effects and special notes**

- A. Assure that signs of altered mental status are present and that other causes for the patient's condition beside diabetes have been considered, hypoxia, stroke, infections, poisonings, head trauma, etc. Assess and assure that the patient is conscious and able to swallow.
- B. There are no side effects if used properly
- C. Can be aspirated into the lungs
- D. Intermediate and EMTs may administer oral glucose

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 241 of 304
---	-----------------------	--------------------------------

## **DILTIAZEM (CARDIZEM)**

### **Pharmacology and actions**

Diltiazem is a calcium channel blocker which demonstrates negative dromotropic properties at both the SA and AV node. This, coupled with its moderate negative inotropic and peripheral vasodilative properties, tends to make diltiazem a favorable medication for heart rate control with less severe side effects than commonly demonstrated by other medications of this class. Diltiazem is hepatically metabolized and excreted through both the renal and biliary systems.

### **Indications**

- A. Reentrant supraventricular tachydysrhythmias.
- B. Atrial fibrillation or atrial flutter with a rapid ventricular response.

### **Precautions**

- A. If appropriate for the presenting dysrhythmia, the use of vagal maneuvers and adenosine are safer, and should be attempted before diltiazem is considered.
- B. Patients who are HEMODYNAMICALLY UNSTABLE (hypotension or congestive heart failure) should be CARDIOVERTED IMMEDIATELY, rather than medicated with diltiazem.
- C. Use with extreme caution in those patients who are taking oral beta-blockers, and DO NOT administer IV beta blockers and calcium channel blockers concomitantly.
- D. Contraindicated in patients with sick sinus syndrome or AV heart block in the absence of a functioning artificial pacemaker.
- E. Absolutely contraindicated in any wide-QRS tachycardia resulting from a poisoning or drug overdose, Wolf-Parkinson-White (WPW) syndrome associated with either atrial flutter or atrial fibrillation, or ventricular tachycardia.
- F. Contraindicated in hypotensive patients, and should be used with great caution in patients prone to diminished cardiovascular preload.

### **Administration**

- A. Adult – Administer 0.25 mg/kg (maximum of 20 mg) IV slowly over 2–3 minutes. If no response after 15 minutes, an additional dose of 0.35 mg/kg (max of 25 mg) IV may be given slowly over 2–3 minutes. Side effects and special notes
- A. Transient drops in arterial pressure are expected. If hypotension is severe or prolonged, consider treatment with IV fluids, dopamine, calcium, or glucagon.
- B. Electrical activity through the SA and AV nodes depends to a significant degree upon calcium influx through the channel. By blocking that response, patients with preexisting nodal disease can develop sinus arrest, increased AV block, complete heart block, and asystole. Treatment may require calcium, catecholamines, atropine, glucagon or pacing.
- C. The administration of diltiazem to the patient in ventricular tachycardia may result in ventricular fibrillation and death. If you have any doubt about the origin of the tachycardia, utilize other therapeutic measures.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 242 of 304
---	-----------------------	--------------------------------

## **DIPHENHYDRAMINE (BENADRYL)**

### **Pharmacology and actions**

- A. An antihistamine which blocks action of histamine released from cells during an allergic reaction.
- B. Direct CNS effects which may be stimulant, or more commonly, depressant, depending on individual variation.
- C. Anticholinergic, antiparkinsonian effect, which is used to treat acute dystonic reactions to antipsychotic drugs (e.g., Haldol, Thorazine, Compazine, droperidol). These reactions include – oculogyric crisis, acute torticollis, and facial grimacing.

### **Indications**

- A. Anaphylaxis and severe allergic reactions.
- B. To counteract acute dystonic reactions to antipsychotic drugs.

### **Precautions**

May have additive effect with alcohol or other depressants.

### **Administration**

- A. **Adult** – 50 mg slow IV push or deep IM.
- B. **Pediatric** – 2 mg/kg slow IV or deep IM (not to exceed 50 mg total).

### **Side effects and special notes**

- A. Benadryl may also be useful for acute dystonic reactions. These reactions can be emotionally and physically trying, but are seldom life-threatening. It may allow transport of a less agitated and anxious patient.
- B. Benadryl occasionally is used prophylactically with haloperidol to increase sedation, and decrease the risk of dystonic reactions.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 243 of 304
---	-----------------------	--------------------------------

## **DOPAMINE (INTROPIN)**

### **Pharmacology and actions**

Dopamine is a chemical precursor of norepinephrine. It occurs naturally in man, and has both alpha and beta receptor stimulating actions, as well as action on specific dopaminergic receptors. At high doses, actions are very similar to those of norepinephrine (Levophed). At lower dose levels, the differential effects allow cardiac stimulation and support of blood pressure without increasing oxygen demand and vasoconstricting vital organs as much as earlier vasopressors. In general, the following actions are seen

- A. 1–2 mcg/kg/min – dilates renal and mesenteric blood vessels (no effect on heart rate or blood pressure).
- B. 2–10 mcg/kg/min – beta effects on heart usually increase cardiac output without increasing heart rate or blood pressure.
- C. 10–20 mcg/kg/min – alpha peripheral effects causes peripheral vasoconstriction and increased blood pressure.
- D. 20–40 mcg/kg/min – alpha effects reverse dilatation of renal and mesenteric vessels with resultant decreased flow.

### **Indications**

- A. Hypotension which is hemodynamically significant in the absence of hypovolemia (i.e., cardiogenic shock).
- B. Septic or neurogenic shock when unresponsive to other measures (secondary use only).

### **Precautions**

- A. DOPAMINE IS CONTRAINDICATED IN HYPOVOLEMIC SHOCK. Pressor agents make tissue hypoxia worse in the presence of hypovolemia. Because even some cardiac patients may be hypovolemic from diuretics and poor fluid intake, careful evaluation is necessary. Invasive monitoring is often the only way to differentiate forms of shock in the elderly and treatment with dopamine is, therefore, indicated in the field only in severely unstable patients with evidence of increased venous pressure.
- B. Dopamine is best administered by an infusion pump to accurately regulate rate. This is another reason it is hazardous for field use. Monitor closely.
- C. May induce tachydysrhythmias, in which case, infusion should be decreased or stopped.
- D. At low doses, decreased blood pressure may occur due to peripheral vasodilatation. Increasing infusion rate will correct this.
- E. Should not be added to sodium bicarbonate or other alkaline solutions since dopamine will be inactivated at higher pH.

**Administration**

- A. Recommended Mix – 400 mg (2 ampules) in 250 ml NS or D5W (or use premixed) to produce concentration of 1600 mcg/ml.
- B. **Adult** – IV infusion ONLY. Start at 5 mcg/kg/min. Increase by 5 mcg/kg/min every 2–3 minutes to a level of 10–20 mcg/kg/min to achieve desired effect. Microdrip chamber only.
- C. **Pediatric** – Not appropriate for prehospital use.

**Side effects and special notes**

- A. Most common side effects include ectopic beats, nausea and vomiting. Angina has also been reported following treatment. Tachycardia and dysrhythmias occur but are less likely than with older pressor agents.
- B. Dopamine "whips" the heart and increases oxygen consumption, although to a lesser extent than other catecholamines. It should be reserved for patients with serious symptomatic hypotension NOT caused by hypovolemia.
- C. Tissue extravasation at the IV site can cause skin sloughing due to vasoconstriction. Be sure to make emergency department personnel aware if there has been any extravasation so proper treatment can be instituted.
- D. Can cause hypertensive crisis.
- E. Certain antidepressants potentiate the effects of this drug. Check for medications and contact base if other medications are being used.
- F. Not indicated for patients with atrial fibrillation.

**Table 7.1 INTRAVENOUS DRIP RATES FOR DOPAMINE**

Concentration – 1600 mcg/ml.					
Drip Rate – microdrips/min					
	Dose (mcg/kg/min)				
Weight (kg)	5	10	15	20	Microdrips Per min
50	10	20	30	40	
60	10	25	35	45	
70	15	25	40	50	
80	15	30	45	60	
90	15	35	50	70	
100	20	35	55	75	
110	20	40	60	85	

Drip rates in table do not yield exact mcg/kg/min, but are very close and are useful for field application.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 245 of 304
---	-----------------------	--------------------------------

## **EPINEPHRINE**

### **Pharmacology and actions**

- A. Catecholamine with alpha ( $\alpha$ ) and beta ( $\beta$ ) effects.
- B. In general, the following cardiovascular responses can be expected
  - 1. Increased heart rate.
  - 2. Increased myocardial contractile force.
  - 3. Increased systemic vascular resistance.
  - 4. Increased arterial blood pressure.
  - 5. Increased myocardial O<sub>2</sub> consumption.
  - 6. Increased automaticity of the heart.
- C. Potent bronchodilatation.
- D. Pupillary dilatation.

The primary effect of epinephrine in cardiac arrest is peripheral vasoconstriction, which leads to improved coronary and cerebral perfusion pressure. It seems to produce beneficial redistribution of blood from peripheral to central circulation during CPR. It may make ventricular fibrillation more responsive to countershock.

### **Indications**

- A. Ventricular fibrillation or pulseless ventricular tachycardia, unresponsive to initial countershocks.
- B. Asystole.
- C. Pulseless Electrical Activity (PEA).
- D. Bradycardia with signs of shock.
- E. Systemic allergic reactions or anaphylaxis.
- F. Asthma.

### **Precautions**

- A. Should not be added directly to bicarbonate infusion.
- B. When used for allergic reactions, increased cardiac work can precipitate angina or MI in susceptible individuals.
- C. Due to peripheral vasoconstriction, should be used with caution in patients with poor peripheral circulation.
- D. Wheezing in an elderly person is more often due to pulmonary edema (pulmonary embolus also possible cause). Epinephrine is not indicated for pulmonary edema.
- E. Because epinephrine is a non-selective  $\beta$  drug, it exerts considerable stimulation effect on the heart. In asthma, particularly in older patients with heart disease, this may be detrimental.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document #  04-2010	Rev.: Page #: 246 of 304
---	---------------------------	--------------------------------

## **Administration**

### **Adult**

- A. Cardiac arrest – 1.0 mg (10 ml of 1:10,000 solution) IV initially, then 1.0 mg IV every 3–5 minutes thereafter. Flush each IV dose with 20 ml fluid.
- B. Anaphylactic shock, laryngeal edema – 1 ml of 1:10,000 SLOW IV or epinephrine drip.
- C. Generalized allergic reaction (with adequate perfusion) – 0.3 mg (0.3 ml of 1:1,000 solution) SQ or IM.
- D. Asthma – 0.3 mg (0.3 ml of 1:1,000 solution) SQ or IM. In patients over 40 years of age, use only for severe respiratory distress.
- E. By Direct Physician Order. – Epinephrine drip 1 to 4 mg in 250 NS or D5W, to enhance adrenergic tone start at 1 mcg/min, titrate to effect.

### **Pediatric**

- A. Cardiac arrest – 0.01 mg/kg (0.1 ml/kg of 1:10,000) IV. Repeat IV dose at 0.1 – 0.2 ml/kg every 3–5 minutes during the arrest. Flush each IV dose with 5–10 ml fluid bolus.
- B. Generalized allergic reaction (with adequate perfusion) – 0.01 mg/kg (0.01 ml/kg of 1:1,000 solution) SQ or IM.
- C. Asthma – 0.01 mg/kg (0.01 ml/kg of 1:1,000) SQ or IM.
- D. Bradycardia associated with signs of shock and unresponsive to airway improvement – 0.01 mg/kg (0.1 ml/kg of 1:10,000) IV – d

### **Side effects and special notes**

- A. Anxiety, tremor, palpitations, and headache are common side effects.
- B. Relatively contraindicated in patients with hypertension, hyperthyroidism, angina, or cerebrovascular insufficiency.
- C. Epinephrine is one prehospital drug that comes in two different strengths. The doses in milligrams are the same, but the volume of solution is different. Errors can be very dangerous (by a factor of 10).
- D. Epinephrine is extremely potent when given IV. It is easy to become cavalier since we commonly treat the cardiac arrest patient with "mega-dose" epinephrine. The effects on a live person with an intact cardiovascular system (even compromised by anaphylaxis) are significantly different. Epinephrine should be given IV in a live adult patient only in 1 ml (1:10,000) increments (0.1 mg) to prevent excess hypertension and dysrhythmias.
- E. Basic prehospital care personnel may administer or assist with administration of an Epi-pen.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 247 of 304
---	-----------------------	--------------------------------

## **ETOMIDATE**

### **Pharmacology and actions**

Etomidate is a hypnotic drug without analgesic activity. Duration of hypnosis is brief, usually three to five minutes. Etomidate is associated with approximately 20% reduction in cerebral blood flow. Therefore, intracranial and intraocular pressures may be reduced with the use of etomidate. Etomidate is primarily metabolized in the liver and excreted in the kidney.

### **Indications**

As a hypnotic agent in conjunction with the use of a paralytic agent to facilitate rapid sequence intubation (RSI) and for sedation in the unstable tachydysrhythmia patient requiring cardioversion.

### **Precautions**

- A. Do not administer unless the solution is clear and the container undamaged.
- B. Etomidate is classified as Pregnancy Category C. No adequate controlled studies have been performed utilizing etomidate on pregnant women. Etomidate should be used in pregnancy only if the benefit outweighs risk.
- C. According to the package insert there are inadequate data for the use of etomidate in pediatric patients. However, a number of studies have subsequently shown no difference in response or complications in pediatric patients compared with adults.
- D. Known allergy or hypersensitivity to etomidate.

### **Administration**

- A. A patent IV or IO line must be established. No other route of administration is permitted.
- B. Administer 0.2 mg/kg of etomidate to all patients undergoing RSI or electrical cardioversion in the unstable patient, unless known severe hypersensitivity to etomidate exists – or if clinical condition is so critical, a “crash” intubation is indicated, excluding etomidate.
- C. Etomidate should be administered as a bolus and pushed over a one minute period of time. Administration times of one minute or more will decrease the likelihood of myoclonic activity.
- D. Etomidate should be given after lidocaine and atropine (if needed) and just before administration of succinylcholine.

### **Side Effects and Special Notes**

- A. Etomidate will not lower blood pressure or raise or lower heart rate if administration is carried out as described above. Therefore, etomidate is safe to use in the hypotensive patient. Typically etomidate has no effect on respiratory drive or the gag reflex. These attributes make etomidate more attractive in certain populations than the benzodiazepine drug class.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 248 of 304
---	-----------------------	--------------------------------

- B. The onset of action for etomidate is between fifteen to sixty seconds. However, duration averages about five minutes. Therefore, in the RSI patient, it is likely that another sedative will need to be employed if intubation is confirmed successful and continued paralysis is maintained. Currently, diazepam or fentanyl will be employed as the adjunctive sedative in RSI cases after etomidate has worn off. Intubated patients, therefore, must be screened to ensure that they meet the required hemodynamic stability criteria before one of these sedatives are administered.
- C. Transient pain on injection at the site of the IV catheter has been reported.
- D. Transient skeletal muscle movements or contractions will be noted in about 30% of patients receiving etomidate. These movements are not seizures. They are myoclonic movements and may involve either unilateral or bilateral muscle groups. There may be an increased incidence in these muscle contractions when the drug is pushed very rapidly. Therefore, etomidate should be administered over a one minute period.
- E. Although, typically etomidate does not cause respiratory depression, hypoventilation or hyperventilation, on rare occasions all of these effects have been reported with this agent. Therefore, the paramedic must be vigilant for any change in respirations after administration of etomidate.
- F. Etomidate has been associated with nausea and vomiting in patients after the drug has worn off. In the intubated patient, this concern should not be much of an issue – since the airway is protected from aspiration. However, if the patient is not able to be intubated, post etomidate vomiting may place the patient at risk for aspiration. Paramedics should watch carefully for the onset of vomiting in the non-intubated RSI patient and be prepared to protect the patient from aspiration.
- G. Although extremely rare, known or suspected history of hypersensitivity to etomidate will be an absolute contraindication to the use of this drug.
- H. Etomidate may be given only once per patient in the EMS setting. Therefore, if the drug appears to be ineffective after one dose, clinical judgment must be employed as to what to do next. In the RSI patient, this may mean proceeding directly to succinylcholine if a case for “crash intubation” may be made.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 249 of 304
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## **FENTANYL (SUBLIMAZE)**

### **Pharmacology and actions**

Sublimaze is a potent, synthetic–opioid analgesic agent, which is approximately 100 times more potent than morphine. It rapidly crosses the blood–brain barrier and tends to produce analgesia within 90 seconds. The clinical benefit of Sublimaze stems from its rapid onset, short duration (30–60 minutes), and minimal histamine activation. Since it binds to opiate receptors, in the same manner as morphine, to produce analgesia, it is reversible with naloxone. It also produces CNS and respiratory depression and must be utilized with caution in those patients who are prone to hypoxia and/or hypoventilation. Due to the minimal histamine release associated with this medication, it is beneficial as an analgesic agent in the face of bronchospastic lung disease and demonstrates minimal cardiovascular and hemodynamic side effects. It does not replace morphine as the analgesic of choice for myocardial pain or as an adjunct to the treatment of CHF patients.

### **Indications**

- A. The primary use of Sublimaze shall be as an analgesic for moderate to severe pain, including cardiac related chest pain.
- B. Also as an adjunctive sedative/hypnotic agent given to RSI patients that have been given vecuronium after a confirmed tracheal–located endotracheal tube.

### **Precautions**

- A. Use caution when administering Sublimaze to patients who suffer from hepatic and/or renal impairment, because drug accumulation/prolonged duration of action may occur.
- B. Muscular rigidity (“Wooden Chest Syndrome”) may occur which prevents adequate chest wall excursion and subsequently results in hypoventilation. This syndrome usually only occurs at higher dosage levels or with rapid administration and is reversible with naloxone. However, constant cardiovascular and pulmonary monitoring is warranted to prevent episodes of hypoxia.
- C. Not recommended for patients currently taking MAO inhibitors since the effects of this combination of medications may be unpredictable.
- D. Do not use in patients suffering from severe hemorrhage, shock, or hemodynamic instability.

### **Administration**

- A. Restricted to IV administration, unless a direct physician order is received for IM administration.
- B. Patients over 2 years of age shall be given 0.5-1.0 mcg/kg in over the course of 1-2 minutes (do not exceed 1.0 mcg/kg without physician order). This may be repeated one time after 10 –20 minutes, titrated to CNS, hemodynamic, and respiratory effects. Additional doses will require direct physician contact.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 250 of 304
---	-----------------------	--------------------------------

- C. When given in the RSI Protocol, the dosage for adult and pediatric patients is 1.0 mcg/kg. fentanyl must only be given to the RSI patient via the IV or IO routes. IM administration is not permitted in the RSI patient. Paramedics should assess the hemodynamic stability of the RSI patient prior to administration of fentanyl – as discussed in the RSI Protocol.

**Side effects and special notes**

- A. Respiratory depression and apnea may result with the administration of this medication. A high level of attentiveness to the patient's respiratory status and prevention of hypoventilation/hypoxia are required. ***Be prepared to intervene!***
- B. Bradycardia is a rare side effect of Sublimaze administration at these dosages. Treat bradycardia with Atropine only after ensuring adequate ventilation and oxygenation.
- C. Other CNS depressant medications or substances may have additive or potentiating effects.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 251 of 304
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## **FUROSEMIDE (LASIX)**

### **Pharmacology and actions**

Furosemide is a potent diuretic with a rapid onset of action and short duration of effect. It acts primarily by inhibiting sodium re-absorption throughout the kidney. Increase in potassium excretion occurs along with the sodium excretion. As an IV bolus, it causes immediate (3–4 minutes) increase in venous capacitance. This decreases venous back-up and probably accounts for an immediate effect in pulmonary edema. Peak effect is 1/2 – 1 hour after IV administration; duration about 2 hours. Duration 6–8 hours if given orally, with a peak in 1–2 hours. Tolerance develops and larger doses may be needed in patients with renal failure or those chronically taking furosemide.

### **Indications**

- A. Acute pulmonary edema – to decrease extracellular volume and reduce venous pressure in the lungs in cardiac failure.
- B. Massive head trauma – used in some regions to treat traumatic cerebral edema and lower intracranial pressure.

### **Precautions**

- A. Do not use in presence of hypotension or other signs of hypovolemia. Can lead to profound diuresis with shock and electrolyte depletion.
- B. Have urinal available. Effect may be seen within 10–15 minutes.
- C. Foley catheter insertion should be considered during long transports (over 30 minutes) or before transferring a head-injured patient receiving diuretics, in order to prevent bladder injury or incontinence.

### **Administration**

- A. **Adult dose** – 40 mg slowly IV (over 2 minutes).
- B. **Pediatric dose** – 1 mg/kg.

### **Side effects and special notes**

- A. Because of potency and need for close monitoring, should only be used in the field in seriously ill patients who require immediate intervention.
- B. Dose of furosemide may need to be increased in patients chronically on furosemide. Check with base if you think larger dose indicated.
- C. May cause acute and profound diarrhea.
- D. Hypokalemia, hyponatremia, and hypovolemia are the main toxic effects. The hypokalemia is of particular concern in digitalized patients, and especially in digitalis-toxic patients.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 252 of 304
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## **GLUCAGON**

### **Pharmacology and actions**

Glucagon is a hormone which causes glucose mobilization in the body. It works opposite to insulin, which causes glucose storage, and it is normally secreted in the pancreas. Glucagon is released at times of insult or injury when glucose is needed. It stimulates the synthesis of cyclic AMP and its metabolic effects are similar to epinephrine. In the hypoglycemic patient, return to consciousness will be about 20 minutes after IM dose.

### **Indications**

- A. Hypoglycemia or insulin shock in patients who are unconscious (unable to take oral solutions) and in whom venous access cannot be obtained.
- B. Hypoglycemia in combative, uncontrollable patient in whom IV dextrose cannot be administered and transport time is over 20 minutes.
- C. To increase myocardial contractility in patients with critically symptomatic Beta blocker or calcium channel blocker overdose.
- D. For management of esophageal spasm.

### **Precautions**

- A. Patients with no liver glycogen stores (due to alcoholism, malnutrition) may not be able to mobilize any glucose in response to glucagon and the treatment will be ineffective.
- B. Hyperglycemic effect of glucagon is of short duration (1–2 hour) so the patient must be transported and fed to replenish glucose stores and prevent recurrence of the hypoglycemia.

### **Administration**

- A. **Adults** – Hypoglycemia – 1.0 mg IM or SQ.  
Beta blocker or calcium channel blocker overdose – 2–4 mg IV. (MUST BE DILUTED WITH D5W or NS FOR THIS PURPOSE, NOT A DILUENT WHICH CONTAINS PHENOL)
- B. Children under 12 years – 0.5 mg IM or SQ.

### **Side effects and special notes**

- A. Nausea and vomiting may occur.
- B. IV glucose or dextrose is the treatment of choice for insulin shock. Use of glucagon is restricted to patients as described above in whom IV access is impossible. In these rare situations, it can be very useful.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 253 of 304
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## **HALDOL (HALOPERIDOL)**

### **Pharmacology and actions**

Haloperidol is a butyrophenone major tranquilizing agent. It probably exerts its antipsychotic effect by blocking post-synaptic CNS dopamine receptors. In addition, haloperidol also causes alpha-adrenergic blockade and has weak anticholinergic and antiemetic effects. Haloperidol may cause sedation and tends to have a high incidence of extrapyramidal side effects. Intramuscular doses are approximately 70% absorbed within 30 minutes. Haloperidol is metabolized through the liver and primarily excreted through the kidneys.

### **Indications**

- A. Acute psychotic disorders.
- B. Severe combativeness that cannot be controlled by reasonable means.

### **Precautions**

- A. Contraindicated in patients with Parkinsonism.
- B. May lower seizure thresholds
- C. Do not use in patients with history of neuroleptic malignant syndrome.
- D. May cause severe neurologic injury in patients taking lithium.

### **Administration**

- A. Patients >12 yrs: Administer 5.0 mg deep **IM**.

### **Side effects and special notes**

- A. Sedation, hypotension, dizziness, severe extrapyramidal symptoms, neuroleptic malignant syndrome, and seizures are among the most concerning with acute administration.
- B. May cause anticholinergic-type symptoms.
- C. Treat extrapyramidal symptoms with diphenhydramine.
- D. May cause prolongation of QT interval. Place patient on cardiac monitor at first opportunity.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 254 of 304
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## **HEPATITIS B VACCINE (RECOMBINANT)**

### **Pharmacology and actions**

The vaccines currently in use in the United States are made with recombinant DNA technology, and contain protein portions of HBV (usually parts of the outer protein or the surface antigen of HBV). Thus, the vaccines do not contain any live virus. More than 95% of children and adolescents and more than 90% of young, healthy adults develop adequate immunity following the recommended three doses. Persons who respond to the vaccine are protected from both acute hepatitis B infections as well as chronic infection.

### **Indications**

- A. Pre–employment/employment related.

### **Precautions**

- B. A serious allergic reaction to a prior dose of hepatitis B vaccine or a vaccine component is a contraindication to further doses of hepatitis B vaccine.
- C. Persons allergic to yeast should not be vaccinated with vaccines containing yeast.
- D. Paramedics should not administer the Hepatitis B vaccine to anyone under the age of 18.

### **Administration**

- A. 1.0 ml IM (Adult). The Deltoid muscle is the preferred site.
- B. Three doses will be required.
  - 1. 1st dose: elected date
  - 2. 2nd dose: 1 month later
  - 3. 3rd dose: 6 months from 1st dose.

### **Side effects and special notes**

- A. Pain in area of injection site, mild fever, and chills may occur.
- B. In rare cases a severe allergic reaction may occur. If so, follow the Allergy/Anaphylaxis protocol.
- C. Administered doses should be documented on a vaccination record and provided to the recipient as well as maintained in agency records. Documentation should include the manufacturer, lot number, expiration date, dose given, and site of injection. Recipient should read an information sheet and sign an authorization and consent form before administration.
- D. Vaccine should be refrigerated at 36–40 degrees F.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 255 of 304
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## **INFLUENZA VIRUS VACCINE**

### **Pharmacology and actions**

Influenza Virus Vaccine is an inoculation of antigens prepared from inactivated influenza virus stimulating the production of specific antibodies. Protection is afforded only against those strains from which the vaccine is prepared or against closely related strains.

### **Indications**

For the production of immunity to influenza virus

- A. Any person who, because of age or underlying medical condition, is at increased risk for complications of influenza.
- B. Healthcare workers and others (including household members) in close contact with high-risk persons.
- C. Persons who wish to reduce their risk of acquiring influenza.

### **Precautions**

- A. Paramedics may not administer vaccine to anyone under the age of 8 years. Persons 8–12 years of age must have had the vaccine previously.
- B. Contraindicated in persons with previous hypersensitivity to any component of the vaccine or allergy to eggs or egg products.
- C. Pregnant women must have a note from their Obstetrician.
- D. Do not administer influenza vaccine within 3 days of pertussis vaccine or combined diphtheria/tetanus/pertussis (DPT) vaccine.

### **Administration**

Age 8 years or older: 0.5 ml IM. Only one dose is required.

### **Side effects and special notes**

- A. Pain in arm at the injection site, fever, chills, headache, muscle aches may occur.
- B. In the event of a presumed allergic reaction such as hives, angioedema, allergic asthma, or systemic anaphylaxis:
  - 1. Activate EMS system.
  - 2. Administer Benadryl 50 mg PO
  - 3. If reaction severe and patient less than 50 years of age, administer epinephrine 1:1000, 0.3 ml S.C.
  - 4. Continue per Allergy/Anaphylaxis protocol.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 256 of 304</p>
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## **IPRATROPIUM BROMIDE (ATROVENT)**

### **Pharmacology and actions**

Ipratropium bromide is an anticholinergic agent which inhibits interaction of acetylcholine at parasympathetic receptor sites on the bronchial smooth muscle. Absorption of ipratropium is minimal following inhalation; thus, significant systemic effects are rare. Most frequent clinical effects include

- A. Bronchial dilatation, with improvement in FEV1 and peak flow rate within 3 minutes. 80% of maximal response is seen within 30 minutes.
- B. Dryness of mouth with bitter taste.

### **Indications**

Ipratropium is indicated as an adjunct bronchodilator for asthma, chronic bronchitis, and emphysema which are not being adequately controlled by beta adrenergic agents such as albuterol.

### **Precautions**

- A. Not to be used as primary therapy for bronchospasm. Must be used with albuterol in nebulizer.
- B. Frequently causes nasal dryness – be prepared to manage epistaxis.
- C. Use with caution in patients who have a history of acute narrow-angle glaucoma, prostatic hypertrophy, and bladder-neck obstruction.
- D. Contraindicated in children under 12 years old.
- E. Contraindicated in patients with hypersensitivity to atropine or its derivatives, soya lecithin, soybean, or peanuts.

### **Administration**

- A. Nebulizer solution – Available as 250 mcg/ml solution in 20 ml multi-dose or 2 ml unit dose vials.  
Metered dose inhaler – Available as 18 and 20 mcg/ actuation in 10 ml canisters
- B. Adults – administer by nebulizer –0.5 mg (2 ml) with 1 unit dose (2.5 mg/3 ml) of albuterol. If available in MDI, administer 2 puffs.
- C. Administer with second dose of albuterol that patient receives.
- D. Repeat doses are recommended every 6 hours; thus, are not applicable in most transport situations.

### **Side effects and special notes**

- A. Mouth dryness, bitter taste, nausea, and epistaxis.
- B. Side effects may include nausea, vomiting, muscle cramps, blurred vision, anxiety, dizziness, headache, and palpitations.
- C. Concomitant use of tetrahydrocannabinol (THC) and anticholinergic agents such as ipratropium may increase the heart rate beyond that expected with either drug alone. Avoid the use of ipratropium in patients who are under the influence of THC, particularly if unable to tolerate tachycardia.
- D. Basic prehospital care providers may be asked to assist with administration of the patient's inhaler. Contact base physician.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 257 of 304
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## IV SOLUTIONS

### Pharmacology and actions

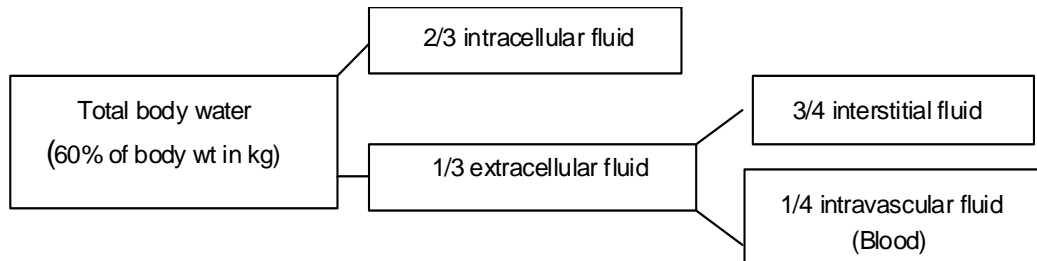
Two types of solutions are available for use in the field.

A. Volume expanders (Ringer's lactate or normal saline)

These contain sodium as the major cation and expand the extracellular fluid space. RL is the same tonicity (concentration of electrolytes) as body fluids. NS is actually slightly hypertonic.

B. Water solution (D5W)

This diffuses through three times the body space of NS and RL. It is therefore, inefficient as a volume expander. Dextrose contained in the solution makes it isotonic to body cells and prevents solution from damaging cells. The dextrose is rapidly metabolized and produces little energy for the body to use (200 cal/L). The net effect is addition of water to the patient.



When replacing fluids

**Blood** – stays in intravascular space.

**Volume expander** (RL or NS) – diffuses through extracellular volume (1/4 stays intravascular).

**Water** (D5W) – diffuses through total body water (1/12 stays intravascular).

### Indications

- A. Volume expanders – to expand intravascular volume in the present of hemorrhagic shock, volume depletion (dehydration, burns, severe vomiting), or shock caused by increased vascular space (neurogenic shock).
- B. Water solutions – to obtain intravenous access to a patient.
1. To treat with IV medications.
  2. To assure later access for treatment in patients with potentially unstable conditions.

### Precautions

- A. In hemorrhagic shock, volume expansion with BLOOD is the treatment of choice. Crystalloid solutions (RL or NS) will temporarily expand intravascular volume and "buy time," but do not increase oxygen-carrying capacity, and are insufficient in severe shock. Because of this, rapid transport is still necessary to treat severely hypovolemic patients who need blood and possibly surgical intervention to stop ongoing bleeding.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document #  04-2010	Rev.: Page #: 258 of 304
---	---------------------------	--------------------------------

- B. Volume overload is a constant danger, particularly in cardiac patients. Keep a close eye on your IV rate during transport. Mysterious excess fluid boluses are all too common. Consider saline lock if fluid is not required.

### **Administration**

- A. Through peripheral vein by needle or cannula.
- B. TKO/KVO = 20–40 microdrips/min = 5–10 drops/min.
- C. For administration of fluid bolus – 20 ml/kg volume expander through large bore cannula, as rapidly as possible.
- D. 1 ml/min = 60 microdrops/min = 10–20 macrodrops/min (depending on administration set).
- E. Needle or cannula size
1. 25 gauge = smaller
  2. 14 gauge = larger
- For administration of volume expanders (RL or NS) – largest diameter possible (14 gauge preferred)
- For administration of water solutions – size not as important; aim for security and accuracy. Larger bore can occasionally be useful.

### **Side effects and special notes**

- A. TKO rate should always be used for water solutions AND for volume
- B. expanders in a stable patient. Without excess fluids, you will know that your patient is stable and not being "helped" by fluids. Give wide open bolus as above if fluids are needed.
- C. In trauma patients, 14 g cannulas should be used most frequently. Flow
- D. rate through a 14 g cannula is twice the rate through an 18 g cannula, and volume administration in trauma patients can be accomplished more rapidly. The larger cannula is more painful to insert, but with practice can be placed reliably. If the patient has poor veins, a smaller bore is better than no IV at all in most instances.
- E. IVs in an unstable trauma patient should be placed enroute, and may be left to the hospital setting for short transports. Do not delay transport for IV attempts.
- F. Two attempts are the limit per person. If you are unable to start in two attempts, another qualified attendant may try, or leave the IVs for the hospital. Some patients are very difficult and some days are more difficult too!
- G. IV fluid bolus for the trauma patient in shock is increasingly controversial. Recent data question the wisdom of pouring fluids into a patient who has ongoing blood loss internally. Patients at risk for internal hemorrhage should have two large bore lines. By system consensus volume expander may be used to maintain a systolic blood pressure of 90–100 mm Hg, until the patient is in the hospital (ED or OR) where internal bleeding can be controlled. Do Not exceed 40 ml/kg of total IV fluid. After bleeding is controlled, those lines may prove invaluable for infusing fluids and blood.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 259 of 304
---	-----------------------	--------------------------------

## **LIDOCAINE (XYLOCAINE)**

### **Pharmacology and actions**

- A. Depresses automaticity of Purkinje fibers; therefore, raises stimulation threshold in the ventricular muscle fibers (makes ventricles less likely to fibrillate).
- B. Little antidysrhythmic effect on atrial muscle at subtoxic levels.
- C. May suppress cough reflex at therapeutic levels. This will result in decreased intracerebral pressure response to intubation and make the aware patient more comfortable while the endotracheal tube is in place.
- D. CNS stimulation: tremor, restlessness and clonic convulsions, followed by depression and respiratory failure at higher doses.
- E. Cardiovascular effects: decreased conduction rate and force of contraction, mainly at toxic levels.
- F. The effect of a single bolus on the heart disappears in 10–20 minutes due to redistribution in the body. Metabolic half-life is about 2 hours; therefore, toxicity develops with repeated doses.

### **Indications**

- A. Significant PVCs in suspected myocardial infarction or contusion when
  1. PVCs more than 6/minute.
  2. Close coupled PVCs (R on T).
  3. Multifocal PVCs.
  4. Runs of 2 or more PVCs in a row.
- B. Ventricular tachycardia or wide-complex tachycardia with pulses.
- C. Recurrent or refractory ventricular fibrillation.
- D. Following successful defibrillation in patients prone to recurrent ventricular fibrillation.
- E. Prior to intubation in patients suspected of having increased intracranial pressure.
- F. Prior to intubation in patients at risk for vagal mediated cardiac dysrhythmias.
- G. May be used to control the cough reflex and associated irritation of the trachea associated with intubation.
- H. For intraosseous anesthetization.

### **Precautions**

- A. Use with extreme caution in presence of advanced A–V block unless artificial pacemaker is in place.
- B. Atrial fibrillation or flutter, quinidine-like effect may cause alarming ventricular acceleration.
- C. Lidocaine is not for treatment of supraventricular rhythms.
- D. Diazepam should be available to treat convulsions if they occur.
- E. Do not treat ventricular escape beats with lidocaine. In severe block, these may be providing patient perfusion.
- F. Do not delay intubation efforts to start an IV or administer medication when the primary need is AIRWAY.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 260 of 304
---	-----------------------	--------------------------------

- G. Anaesthetization of the airway structures may present problems associated with aspiration if the patient is extubated before the effects of the lidocaine have worn off. Maintain the integrity of the airway and ensure that the receiving facility is aware of this danger.

**Administration**

INTERMITTENT IV BOLUS METHOD – for cardiac arrest

- A. **Adult** –1.0 – 1.5 mg/kg IV bolus.  
**Pediatric** – 1 mg/kg IV bolus
- B. Second bolus of 0.5–0.75 mg/kg IV after 5 min for persistent VF.
- C. Third bolus of 0.5–0.75 mg/kg given after another 5 min during long transports with persistent VF. Max 3 mg/kg by bolus only.

IV BOLUS AND DRIP METHOD – to treat significant PVCs in patient with good circulation

- A. 1 mg/kg slow IV bolus, adult and pediatric.
- B. 2nd bolus of 0.5–0.75 mg/kg IV is given 5 minutes after 1st bolus in addition to drip. Max 3 mg/kg by repeat bolus.
- C. IV drip – Mix 1 gm lidocaine in 250 ml NS or D5W for a concentration of 4 mg/ml (or use premixed drip solution, 2 gm lidocaine in 250 ml for concentration of 8 mg/ml). Run 2–4 mg/min (20–40 mcg/kg/min) or 30–60 microdrops/min. Must be started soon after first bolus or blood levels will rapidly disappear.

SINGLE IV BOLUS DOSING – for intubation.

Single IV dose (1.5 mg/kg) if time available in patient who needs intubation and has potential for increased intracranial pressure. Administer at least 60 seconds before intubation.

ENDOTRACHEAL ROUTE DOSING

- A. Cardiac Arrest – 2–3 mg/kg ET with 10 ml total volume.
- B. Tracheal Irritation – 1.5 mg/kg ET.

NOTE – Bolus (to 3 mg/kg) may be administered through endotracheal tube.

**Side effects**

- A. CNS disturbances – sleepiness, dizziness, disorientation, confusion, muscular twitching, focal or grand mal seizures.
- B. Hypotension – increased A–V block and decreased myocardial contractility at toxic levels only.
- C. Rare instances of sudden cardiovascular collapse and death.
- D. Toxicity increased in elderly patients and those with liver impairment.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 261 of 304</p>
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**Special notes**

- A. Lidocaine is metabolized in the liver and elderly patients and patients with hepatic disease, shock or congestive heart failure will not break down the drug rapidly. Administer 1.0 mg/kg and reduce the drip by one-half. Second bolus usually not indicated.
- B. A bolus of lidocaine will establish a given level of drug in the blood. The drip maintains this level by replacing metabolized drug. It should, therefore, be started rapidly. Without a bolus, a drip has no effect for 30–60 minutes. The second bolus is given to prevent an observed dip in blood level which occurs 20 minutes after initial bolus and drip.
- C. Lidocaine is another drug which comes in different concentrations
  - 1. *Prefilled Syringes* – 50–100 mg in 5–10 ml for bolus administration (1% solution).
  - 2. *Vials* – 500–1000 mg in 5–10 ml solution for IV drips (10% solution).
  - 3. *Premixed drip solution* – 2 Gm in 250 ml NS OR D5W for concentration of 8 mg/ml.
- D. The desire to treat all PVCs is a disease called the "lidocaine itch." It is commonly found in field and hospital personnel. PVCs should be treated only when significant and premature ventricular beats are encountered in the setting of acute angina or MI. PVCs generated by hypoxia will not respond to lidocaine and the wrong life–threat will be treated.
- E. Prophylactic lidocaine in the patient with cardiac type chest pain is no longer recommended. The patient with chest pain who is also having frequent or multifocal PVCs, however, should have lidocaine administered to treat PVCs. This is not the same as prophylactic use (giving the drug before it is needed to prevent it being needed). Do not hesitate to treat dangerous PVCs in the patient with suspected cardiac chest pain.
- F. An endotracheal tube is quite distressing and uncomfortable in the patient with some degree of awareness. “Bucking the tube” is common. Local anesthetic (lidocaine down the tube for tracheal irritation and benzocaine topically for pharyngeal stimulation) and IV pain control and/or sedation are clearly humane and recommended when it is preferred for the patient to remain intubated.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 262 of 304
---	-----------------------	--------------------------------

## **LIDOCAINE VISCOUS**

### **Pharmacology and actions**

As a local anesthetic, lidocaine acts to block initiation and conduction of nerve impulses by decreasing the permeability of the nerve cell membrane to sodium ions.

### **Indications**

Local anesthesia of skin or mucous membranes – Use as a lubricant and local anesthetic for procedures such as nasopharyngeal airways, nasotracheal intubation, orotracheal intubation, or insertion of foley catheters.

### **Administration**

- A. Viscous lidocaine comes as a 2% solution (20 mg/ml).
- B. Lubricate tube liberally prior to insertion.
- C. Insert tube as specified by type (NPA, ETT, etc).
- D. Onset of action occurs in 3–5 minutes.

### **Precautions**

- A. Do not use in patients with a hypersensitivity to amide–type local anesthetics.
- B. Monitor patient for any type of allergic reaction after use of viscous lidocaine.
- C. When viscous lidocaine is used concomitantly with other products containing Lidocaine, the total dose contributed by all formulations must be kept in mind.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 263 of 304
---	-----------------------	--------------------------------

## **MAGNESIUM SULFATE**

### **Pharmacology and actions**

Magnesium is a cofactor for many enzymatic reactions. It is essential for the function of the sodium–potassium ATPase pump. Magnesium prevents or controls convulsions by blocking neuromuscular transmissions. Magnesium has a depressant effect on the CNS. It acts as a physiological calcium channel blocker and may also produce heart block. Magnesium may reduce the incidence of post infarction ventricular dysrhythmias.

### **Indications**

- A. Pregnant patients (usually greater than 20 weeks) with preeclampsia.
  - 1. Blood pressure greater than 180 systolic or 120 diastolic.
  - 2. Altered mental status.
  - 3. Generalized or severe localized edema.
  - 4. Headache and/or visual disturbance.
- B. Pregnant patients (usually greater than 20 weeks) with eclampsia – any of the above signs AND seizures.
- C. Polymorphic V tach or suspected hypomagnesemic states.
- D. May be useful for the treatment of asthma which is severe and not responding promptly to albuterol.

### **Precautions**

- A. May occasionally lead to A–V blocks or respiratory arrest. Calcium chloride may reverse respiratory and cardiac effects. Calcium should be readily available before administration of magnesium sulfate.
- B. Not indicated in patients with heart block or significant cardiac disease. (Use caution if patient is taking digitalis.)

### **Administration**

Administer 1–2 Gm in 50 ml NS OR D5W to run in over 5–10 minutes (IV push in cardiac arrest only).

### **Side effects and special notes**

- A. Principle complication is respiratory depression: Be prepared. Never administer as a bolus unless the patient is in cardiac arrest.
- B. May need to decrease dosage if patient is using other depressant drugs (e.g., barbiturates, narcotics, hypnotics). Effects may be additive and increase the risk of respiratory depression.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 264 of 304
---	-----------------------	--------------------------------

## **METERED DOSE INHALERS (MDI)**

### **Pharmacology and actions**

Bronchodilator dilates bronchioles, reducing resistance in the airway thus improving oxygenation and making breathing easier.

The following are medications that may be encountered

Albuterol, Isoetharine, Metaproterenol, Proventil, Ventolin, Bronkosol, Bronkometer, Metaprel, Alupent

### **Indications**

- A. The patient exhibits signs of respiratory distress.
- B. The patient has an inhaler prescribed to the patient, by a physician.
- C. The prescribed inhaler has not expired.

### **Precautions**

Assisting the patient in the use of an inhaler is contraindicated if any of the following conditions exist.

- A. The patient is unconscious or otherwise unable to use the device.
- B. The inhaler is not prescribed for the patient, (someone else's inhaler).

### **Administration**

- A. The number of inhalations is based on a physician's prescribed dose
- B. Two MDI "puffs" are often prescribed PRN as a normal dose.
- C. When the Basic-EMT encounters a respiratory distress patient who has a prescribed inhaler, follow the steps below to assist the patient in its use.
  - 1. Administer oxygen and listen to breath sounds.
  - 2. Determine if the patient has taken any doses of the medication, if so, how many and when.
  - 3. Assure that the medication is the correct one (bronchodilator) and that it has been prescribed for the patient.
  - 4. Assure that the patient is able to use the device.
  - 5. Check the expiration date on the inhaler.
  - 6. Obtain authorization from base physician, to assist with administering the medication.
  - 7. Assure that the inhaler is at room temperature or warmer.
  - 8. Shake the inhaler vigorously for at least 30 seconds.
  - 9. Remove the oxygen delivery device from the patient (or turn it off momentarily).
  - 10. Have the patient hold the inhaler upright, exhale deeply and place lips around its opening. (If the patient is unable to hold the inhaler, hold it for them by placing your index finger on the top of the metal canister and your thumb on the bottom of the plastic canister).
  - 11. Instruct the patient to depress the inhaler while inhaling deeply or depress the inhaler for the patient while the patient inhales deeply. (Usually, two MDI "puffs" are prescribed as a normal dose).

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 265 of 304
---	-----------------------	--------------------------------

12. Coach the patient to hold their breath for as long as is comfortable so that the medication can be absorbed.
13. Replace the oxygen delivery device (or continue flow) on the patient after assisting with the MDI.
14. If medical direction authorizes a second dose of the medication, repeat steps 7–12 after the patient has taken several breaths.

**Side effects and special notes**

- A. Side effects may include increased heart rate, nervousness and tremors.
- B. It is important to determine how many doses, if any, of the medication that patient has already taken. Medical direction can then determine how much, if any, should be administered.
- C. Some types of inhalers contain medications other than bronchodilators. In general, EMT's should not assist with the use of these types of inhalers in the prehospital setting.
- D. Some inhalers are connected to a device called a "spacer" or "aerochamber." The spacer is a chamber into which the medication is delivered, before the patient inhales. The spacer prevents any loss of the medication to the outside air and permits more effective use of the medication. If the patient has a spacer with their inhaler, be sure to use it.
- E. Paramedics and intermediate EMT's should, if at all possible, utilize nebulized medications for delivery of bronchodilators to patients with breathing difficulty.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 266 of 304
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## **MORPHINE SULFATE (MS)**

### **Pharmacology and actions**

- A. Analgesia.
- B. Pupil constriction.
- C. Respiration – decreased rate and tidal volume.
- D. Peripheral vasodilatation.
- E. Cardiac effect (reflex due to vasodilatation)
  - 1. Decreased myocardial oxygen consumption.
  - 2. Decreased left ventricular end–diastolic pressure.
  - 3. Decreased cardiac work
  - 4. May decrease incidence of dysrhythmias.
- F. Effect – maximum within 7 minutes IV.

### **Indications**

- A. Presumed cardiac chest pain or anginal equivalent.
- B. Treatment for pain.

### **Precautions**

- A. Hypotension is a relative contraindication to use of morphine. *Remember that some people will be hypotensive in response to pain itself.* Smaller doses are less likely to cause or aggravate hypotension.
- B. Do not use in persons with respiratory difficulties (except pulmonary edema) because their respiratory drive may become depressed.
- C. Do not use in the presence of major blood loss. The body's compensatory mechanisms will be suppressed by the use of morphine and the hypotensive effect will become very prominent.
- D. May cause vomiting. Administer slowly.

### **Administration**

- A. IV only (unless you cannot start an IV and are specifically directed to administer IM).
- B. **Adult** – 2–4 mg IV initially, repeat every 5 minutes if needed. Do not exceed 0.2 mg/kg. The goal is decreased anxiety and patient comfort. The patient need not be completely pain–free.

### **Side effects and special notes**

- A. The major side effects and complications from morphine result from vasodilatation. This causes no problems if the patient is supine and not volume depleted. It may cause problems if the patient is upright, hypovolemic, or has decreased cardiac output (after MI).

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 267 of 304
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- B. Allergic reactions are rare, but ask! If patient reports allergy to other narcotics – ask for the reaction. Codeine notoriously causes nausea, vomiting, or GI distress. These are not allergic reactions and should have no effect on your use of morphine. The patient who reports allergies to many narcotics and reports swelling of the airway, shock, or other significant responses, however, should not receive morphine.
- C. Be prepared to ventilate if the patient stops breathing. Naloxone can be used to reverse medication effects, but it leaves no good alternative for pain relief. Respiratory support may be a better alternative.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 268 of 304
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## NALOXONE (NARCAN)

### Pharmacology and actions

Naloxone is a narcotic antagonist which competitively binds to narcotic sites but which exhibits almost no pharmacologic activity of its own. Duration of action is 1–4 hours.

### Indications

- A. Reversal of narcotic effects, particularly respiratory depression due to narcotic drugs either ingested, injected or administered in the course of treatment. Diagnostically in coma of unknown etiology to detect or reverse narcotic cardiorespiratory depression if present.
- B. Seizure of unknown etiology to reverse possible narcotic overdose (particularly propoxyphene).

### Precautions

- A. In patients who are addicted to narcotics, frank and occasionally violent withdrawal symptoms may be precipitated. Titrate the dose (0.2 ml at a time) to reverse cardiac and respiratory depression but keep the patient groggy. Be prepared to restrain the patient.
- B. Titration may also assist the patient who is taking narcotics for pain (patients with known cancer). Very small amounts over time can reverse the respiratory depression, but still leave the patient with some pain control.
- C. May need large doses (8–12 mg) to reverse propoxyphene (Darvon) overdose.

### Administration

- A. Supplied in various concentrations. Stock and use only one, if possible, to avoid confusion or drug errors.
  1. 1 ml ampule = 0.4 mg.
  2. 10 ml vial = 4.0 mg.
- B. **Adult** – 0.4 mg IV, repeat as needed.  
**Pediatric** – 0.04 mg/kg IV
- C. If no response is observed, this dose may be repeated after 5 minutes if narcotic overdose is strongly suspected.

### Side effects and special notes

- A. The duration of some narcotics is longer than naloxone. The patient must be monitored closely since repeated doses of naloxone may be necessary. Patients who have received this drug must be transported to the hospital since coma may recur as naloxone wears off.
- B. With an endotracheal tube in place and assisted ventilation, narcotic overdose patients may be safely managed without naloxone. Smaller doses of narcan can be used to assure adequate ventilaton. **Think twice before totally reversing coma. Airway control may be lost, or worse, the patient may become extremely violent.**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 269 of 304
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## **NITROGLYCERIN**

### **Pharmacology and actions**

- A. Cardiovascular effects include
  1. Reduced venous tone, causing blood-pooling in peripheral veins and decreasing venous return to the heart.
  2. Decreased peripheral resistance.
  3. Dilatation of coronary arteries (if not already at maximum) and relief of coronary artery spasm.
- B. Generalized smooth muscle relaxation (including esophagus).

### **Indications**

- A. Angina or anginal equivalents.
- B. Chest, arm, or neck pain thought caused by coronary ischemia.
- C. Control of hypertension in angina or acute MI.
- D. Pulmonary edema – to increase venous pooling, lowering cardiac preload and afterload.

### **Precautions**

- A. Generalized vasodilatation may cause profound hypotension and reflex tachycardia.
- B. NTG loses potency easily. It should be stored in dark glass container with tight lid and not exposed to heat.
- C. Use with caution in hypotensive patients.
- D. Do Not Use Nitrates in patients who have taken Viagra (or other sexually enhancing drugs) in the last 12–36 hours.
- E. Nitrates may be associated with significant hypotension especially in patients with inferior wall and/or right ventricular myocardial infarction.

### **Administration**

- A. **Adult** – 0.4 mg (1/150) tablet or spray sublingually. May repeat every 5 minutes as needed for effect.
- B. **Pediatric** – Not indicated for use in children.

### **Side effects and special notes**

- A. Common side effects include throbbing headache, flushing, dizziness and burning under the tongue. These side effects may be used to check potency of medication.
- B. Less common – orthostatic hypotension, sometimes marked. Be prepared to lay patient flat and elevate legs if blood pressure drops.
- C. Therapeutic effect is enhanced but adverse effects are increased when patient is upright.
- D. Because nitroglycerin causes generalized smooth muscle relaxation, it may be effective in relieving chest pain caused by esophageal spasm.
- E. Basic prehospital care personnel may assist with administration of the patient's nitroglycerin after direction from base physician. EMT Intermediates may administer nitroglycerin sublingually under standing orders

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 270 of 304
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## **ONDANSETRON (ZOFRAN)**

### **Pharmacology and actions**

Ondansetron is a selective serotonin antagonist, which inhibits nausea and vomiting caused by the activation of chemoreceptors in the medullary structures of the brain and visceral stimuli in the small bowel. It has little to no effects on nausea and vomiting caused by the release of histamine and acetylcholine from vestibular causes.

### **Indications**

Non-vestibular causes of nausea and vomiting

### **Contraindications**

Sensitivity or allergy to serotonin antagonists

### **Administration**

- A. Adults and children over 40 kg: 4 mg IV over 2 minutes (may also be given IM)
- B. Children over 1 month of age and less than 40 kg: 0.1 mg/kg not to exceed 4 mg
- C. Adults and children over 11 years old: 8 mg ODT tablet
- D. Children 4 – 11 years old: 4 mg ODT

### **Side effects and special notes**

- A. Occasionally, there have been reported cases of transient prolongation of the QT interval
- B. Rare cases of seizure activity and extrapyramidal reactions have been reported

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 271 of 304
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## OXYGEN

### Pharmacology and actions

Oxygen added to the inspired air raises the amount of oxygen in the blood, and therefore, the amount delivered to the tissues. Tissue hypoxia causes cell damage and death. Breathing in most persons is regulated by small changes in acid/base balance and CO<sub>2</sub> levels. It takes relatively large drops in blood O<sub>2</sub> concentration to stimulate respiration.

### Indications

- A. Respiratory distress or suspected hypoxemia from any cause.
- B. Chest pain in which myocardial ischemia or infarction is suspected.
- C. Major Trauma or Shock (decreased oxygenation of tissues) from any cause.
- D. Any inhalation or noxious gas exposure.
- E. High altitude illness.

### Precautions

- A. If the patient is not breathing adequately on his own, the treatment should be ventilation, not just O<sub>2</sub>. A nasal cannula without a breath is a waste of O<sub>2</sub> (and patients)!
- B. A small percentage of patients with chronic lung disease breathe because they are hypoxic. Administration of O<sub>2</sub> may shut off their respiratory drive. **DO NOT WITHHOLD OXYGEN BECAUSE OF THIS POSSIBILITY. BE PREPARED TO ASSIST VENTILATION, IF NEEDED.** Initial O<sub>2</sub> flow should be 2 L/min or 1 L/min greater than home O<sub>2</sub> in these patients.
- C. If pulse oximetry is available, titrate oxygen saturation (SaO<sub>2</sub>) to 90% or greater. Be aware, however, that in some cases, the reading will be meaningless (CO poisoning) and oxygen flow should be at a maximum (10–15 L/min). In patients with COPD, pulse oximetry may not reach 90% even with high flow, non-rebreather mask.

### Administration

Dosage	Indications
Low flow (1–2 L/min)	Patients with chronic lung disease.
Moderate flow (4–6 L/min)	Minimal respiratory difficulty. Trauma. Abdominal Pain.
High flow (10–15 L/min)	Severe breathing difficulty. Carbon monoxide poisoning. Chest pain. Shock. Smoke inhalation.

### Side effects and special notes

- A. Non-humidified O<sub>2</sub> is drying and irritating to mucous membranes.
- B. Restlessness may be an important sign of hypoxia. Do not let a combative, head-injured patient deter you from application of O<sub>2</sub>.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 272 of 304
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## **PHENYLEPHRINE (NEO-SYNEPHRINE)**

### **Pharmacology and actions**

Phenylephrine nasal spray exhibits primarily alpha-adrenergic stimulation. This can produce moderate to marked vasoconstriction and nasal decongestion. Other alpha effects such as mydriasis and pressor effects may be apparent even with topical use to mucous membranes.

### **Indications**

- A. Primarily used prior to nasotracheal intubation to decrease nasal bleeding from intubation trauma.
- B. May relieve ear block and pressure pain with altitude changes by decreasing congestion around eustachian ostia.
- C. May be used to augment the treatment of anterior epistaxis.

### **Precautions**

- A. Use with caution, or do not use electively, in patient with known hypertension, hyperthyroidism, diabetes mellitus, or cardiovascular disease.
- B. The very young or very old patient will be more likely to have idiosyncratic reactions.

### **Administration**

- A. Nasal spray (1%) – 2 sprays in each nostril for **adults**. 1 spray in each nostril for **children or elderly**.
- B. Soak a cotton ball with neosynephrine (squeeze out excess) and place the medicated cotton ball into the affected nare. Continue providing external direct pressure to the nares.

### **Side effects and special notes**

- A. When used to relieve otitic barotrauma, the best results are from pretreatment before descending in altitude. If descending and patient experiences pain – stay level or ascend to comfort level. Administer spray and wait 5–10 minutes if time is not critical. Descend when patient reports comfort and/or ability to "pop" ears.
- B. When used as pretreatment for nasotracheal intubation, the precautions should not cause undue concern. The patient must need airway assistance but not be in extremis.
- C. When using neosynephrine for the control of epistaxis, always attempt direct external nare pressure first.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 273 of 304
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## **RACEMIC EPINEPHRINE (VAPONEFRIN)**

### **Pharmacology and actions**

Racemic epinephrine is an epinephrine preparation with a combination of "L" and "D" isomers of epinephrine for use by inhalation only. Effects are those of epinephrine. Inhalation causes local effects on the upper airway as well as systemic effects from absorption.

### **Indications**

- A. Airway obstruction due to croup.
- B. Anaphylaxis in pediatric patients without IV access.

### **Precautions**

- A. Mask and noise may be frightening to small children. Agitation will aggravate symptoms of respiratory obstruction. Try to enlist the support of parents and child.
- B. Try to differentiate croup from epiglottitis by history. Do not use a tongue blade to examine the back of the throat. The diagnosis is frequently difficult in the field, but a critical patient deserves a trial of racemic epinephrine during transport. Although used as specific therapy for croup, it may also buy some time in patients with epiglottitis.
- C. In the less-than-critical patient, saline alone via nebulizer may bring symptomatic relief from croup.
- D. Racemic epinephrine is heat and light sensitive. It should be stored in a dark cool place. Discoloration is an indication to discard medication.

### **Administration**

- A. **Over 2 years** – 0.5 ml racemic epinephrine + 2 ml saline, via nebulizer driven by O<sub>2</sub> (6–8 L/min) to create fine mist.
- B. **2 years or less** – 0.3 ml racemic epinephrine + 2 ml saline, via nebulizer driven by O<sub>2</sub> (6–8 L/min) to create fine mist.

### **Side effects and special notes**

- A. Tachycardia and agitation are the most common side effects. Other side effects of parenteral epinephrine may also be seen. (Since these are also the hallmarks of hypoxia, watch the patient very closely!)
- B. Nebulizer treatment may cause blanching of the skin of the mask area due to local epinephrine absorption. Reassure parents.
- C. If respiratory arrest occurs, it is usually due to patient fatigue or laryngeal spasm. Complete obstruction is not usually present. Ventilate the patient, administer O<sub>2</sub> and transport rapidly. If you can ventilate and oxygenate the patient adequately with pocket mask, or BVM, intubation is best left to a specialist in a controlled setting.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document #  04-2010	Rev.: Page #: 274 of 304
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## SODIUM BICARBONATE

### Pharmacology and actions

Acids are increased when body tissues become hypoxic due to cardiac or respiratory arrest. While respiratory acidosis and mild metabolic acidosis do not require bicarbonate, marked metabolic acidosis may depress cardiac contractility, depress the cardiac response to catecholamines, and may lower the threshold to fibrillation.

### Indications

- A. To correct the suspected acidosis found during cardiac arrest.
- B. Hypotension or dysrhythmias associated with tricyclic antidepressant overdoses.
- C. Therapy for cardiac instability associated with suspected acute hyperkalemia.

### Precautions

- A. Should not be given in mixture with catecholamines or calcium.
- B. May increase cerebral acidosis, especially in diabetics who are ketotic.

### Administration

- A. Solutions
  1. **ADULT / PEDIATRIC** – 8.4% – 1.0 mEq/ml
  2. **INFANTS (30 days old, or less)** – 4.2% = 0.5 mEq/ml. Sodium bicarbonate is administered as half-strength solution(4.2%) for infants 30 days or less. Use premixed pediatric ampules or dilute adult strength 1:1 with saline. Dose is 1 mEq/kg or 2 ml/kg of the 4.2% solution.
- B. For cardiac arrest
  1. **ADULT / PEDIATRIC** – 1 mEq/kg (1 ml/kg). Consider 10 minutes after arrest, then consider 0.5 mEq/kg (0.5 ml/kg) every 10 minutes thereafter until blood gases are available.
  2. **INFANTS (30 days old, or less)** – 1 mEq/kg (2 ml/kg). Consider 10 minutes after arrest then consider 0.5 mEq/kg (1 ml/kg) every 20 minutes thereafter. Sodium bicarbonate is administered as half-strength solution(4.2%) for infants 30 days or less. Use premixed pediatric ampules or dilute adult strength 1:1 with saline. Dose is 1 mEq/kg or 2 ml/kg of the 4.2% solution.
- C. For tricyclic OD with hypotension or prolonged QRS (> 0.10 second) – 1.0 mEq/kg IV, repeat if needed in 10–15 minutes.

### Side effects and special notes

- A. Hyperosmolarity of the blood can occur because the NaHCO<sub>3</sub> is concentrated. This results in cerebral impairment.
- B. In children 10 kg or less, half-strength solution is used to avoid the high concentration of the 8.4% solution. Give slowly also, to prevent rapid fluid shifts and intracranial pressure changes in infants.
- C. Hyperventilation corrects respiratory acidosis by removing CO<sub>2</sub>, which is freely diffusible across cellular and organ membranes. There is little data indicating that therapy with buffers (including bicarbonate) improves outcome.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 275 of 304
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## **SUCCINYLCHOLINE (ANECTINE)**

### **Pharmacology and actions**

Succinylcholine is an ultra–short acting depolarizing skeletal muscle relaxant, which is used to chemically paralyze a patient to facilitate intubation.

### **Indications**

Only to facilitate intubation of patients as described in the RSI protocol.

### **Precautions**

- A. Transient increases in intragastric pressure. Use the Sellick’s maneuver immediately upon injection of succinylcholine and continue it until the patient has been intubated or until the patient is able to breathe again on their own and protect their own airway. Have suction available.
- B. Life–threatening hyperkalemia may result with the administration of succinylcholine. Patients that are at risk for hyperkalemia (recent major burns, crush injuries, and multiple trauma, renal failure, and known hyperkalemia) may suffer cardiac arrest with the administration of succinylcholine.
- C. Patients who have a known hypersensitivity to succinylcholine and those who have a history of malignant hyperthermia should never be administered succinylcholine. .

### **Administration**

All patients should be given 2.0 mg/kg intravenously one time only.

### **Side effects and special notes**

- A. Administration of succinylcholine may cause bradycardia and asystole in both adults and children. The incidence of this occurrence is higher in children than adults, and is increased in both age groups by the administration of a second dose of the drug. Pre–treatment with atropine (0.5 mg for adults and children >12 y/o) (0.02 mg/kg for children <12 y/o. Maximum of 0.5 mg per dose. Minimum of 0.1 mg per dose) may prevent this occurrence.
- B. The progression of paralysis normally begins with relaxation of the eyelids (ptosis) and jaw, then progresses to limbs, abdomen, and then diaphragm and intercostal muscles. Ptosis and jaw relaxation will be your first indicators to prepare to place the laryngoscope and upon flaccid paralysis of the patient, intubation should be performed.
- C. Always have suction immediately available and always utilize a Sellick’s maneuver.
- D. The use of induction agents and pre–intubation lidocaine (1.5 mg/kg IV) may blunt the rise in ICP and IOP.
- E. Succinylcholine has no effect on consciousness or pain. Sedative use is required.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 276 of 304
---	-----------------------	--------------------------------

## **TETANUS–DIPHTHERIA VACCINE (Td)**

### **Pharmacology and action**

Td is a tetanus–diphtheria vaccine given to adolescents and adults as a booster shot every 10 years, or after an exposure to tetanus under some circumstances. This vaccine works by exposing you to a small dose of the bacteria or a protein from the bacteria, which causes the body to develop immunity to the disease.

### **Indications**

- A. Pre–employment/employment related if lack of evidence of having received tetanus vaccine in the previous 10 years.
- B. Recent deep and dirty wound (e.g., contaminated with dirt, feces, saliva) and lack of evidence of having received tetanus toxoid–containing vaccine in the previous 5 years.

### **Precautions**

- A. A serious allergic reaction to a prior dose of Td vaccine or a vaccine component is a contraindication to further doses of Td vaccine.
- B. A physician’s consultation is required if history of an unstable neurological condition or history of Guillain–Barré syndrome
- C. Persons with moderate or severe illness on the day any vaccine is scheduled should probably be delayed until full recovery
- D. Paramedics should not administer the Td vaccine to anyone under the age of 18.

### **Administration**

0.5 ml IM (Adult). The Deltoid muscle is the preferred site.

### **Side effects and special notes**

- A. Pain in area of injection site, mild fever, and chills may occur.
- B. In rare cases a severe allergic reaction may occur. If so, follow the Allergy/Anaphylaxis protocol.
- C. Administered doses should be documented on a vaccination record and provided to the recipient as well as maintained in agency records. Documentation should include the manufacturer, lot number, expiration date, dose given, and site of injection. Recipient should read an information sheet and sign an authorization and consent form before administration.
- D. Vaccine should be refrigerated at 36–40 degrees F.
- E. Use of Td is not contraindicated in pregnancy. At a physician’s discretion, either vaccine may be administered during the 2nd or 3rd trimester.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 277 of 304
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## **TOPICAL OPHTHALMIC ANAESTHETICS**

### **Pharmacology and actions**

Topical ophthalmic medications have a rapid (15–30 second) onset of anaesthesia with 15–20 minute duration.

### **Indications**

Corneal anaesthesia of short duration for patients presenting with corneal abrasion, chemical burns or irritation.

### **Precautions**

- A. The use of topical ophthalmic anaesthetics is contraindicated in the presence of severe globe injuries. If the integrity of the globe is in question, do not use these agents.
- B. Application of these agents may result in a total relief of symptoms. Therefore, do not apply anaesthetic until the patient consents to transport to an emergency department for definitive care.
- C. The use of these agents shall be considered contraindicated if the patient has any known sensitivity or allergy to any local anaesthetics or to PABA (para-aminobenzoic acid)-containing products.
- D. The long-term/prolonged use of topical anaesthetics can be deleterious (corneal erosions/sloughing, permanent corneal opacification with resultant blindness, etc)  
**DO NOT GIVE THE PATIENT THE BOTTLE.**

### **Administration**

- A. Only the following agents are approved: proparacaine and tetracaine, both in 0.5% preparations.
- B. Use only fresh and unopened bottle for each patient. If discolored (indicating contamination) do not use. Do not touch the tip of the bottle on anything, including the eye, as this may result in contamination of the medication.
- C. Place 2 drops in the effected eye(s). Only one application is allowed in the prehospital setting without specific physician approval.

### **Side effects and special notes**

- A. During the period of anaesthesia protect the patients eyes from further injury. The patient will not be able to feel the introduction of new foreign bodies, chemicals, etc. Do not allow the patient to rub their eyes. Protect the eye from dust and other hazards.
- B. Occasional burning/stinging, lacrimation, and photophobia may occur upon initial instillation of drops. This is usually a transient side effect and occurs less often with proparacaine. However, proparacaine may produce a delayed irritation/stinging to the eyes several hours after administration.
- C. Both agents are associated with a rare, severe, immediate-type hyperallergenic corneal reaction which results in acute, intense, and diffuse epithelial keratitis and sloughing of large areas of necrotic epithelium.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 278 of 304
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## **TUBERCULIN PPD, DILUTED**

### **Pharmacology and actions**

Tuberculin purified protein derivative (PPD) is recommended as an aid in the detection of infection with Mycobacterium tuberculosis.

### **Indications**

As a routine screening tool for public safety providers

### **Precautions**

- A. Paramedics may not administer vaccine to anyone other than public safety providers.
- B. Contraindicated in persons with previous hypersensitivity to any component of the vaccine, who have previously experienced a severe reaction to testing, or who have known sensitivity to TB.
- C. Avoid injecting tuberculin subcutaneously. Sub Q injection results in no local reaction, but a general febrile reaction and/or acute inflammation around old tuberculous lesions.

### **Administration – by standing order**

- A. Mantoux Test: 0.1 ml intrademally, using a TB syringe fitted with a 25–27 gauge, 1/2 inch needle.
- B. The site of the test is usually the flexor or dorsal surface of the forearm approximately 4 inches below the elbow. The area should be free of lesions and away from veins.
- C. As the tuberculin solution is injected, a pale bleb 6–10 mm in size will rise over the point of the needle. If a bleb does not develop, the solution was injected subcutaneously requiring the test to be repeated in the other arm.
- D. Interpretation of results.
  1. Readings of reactions should be made during the period from 48–72 hours after the injection.
  2. Induration only should be considered in interpreting the test. An induration is a raised, hardened area over the test site.
  3. The diameter of induration should be measured transversely to the long axis of the forearm and recorded in millimeters.
  4. Any induration 5mm or greater warrants referral.
  5. Considered negative if less than 5mm induration.

### **Side effects and special notes**

- A. Side effects include fever and erythema, ulceration, or necrosis at the site.
- B. A positive test does not mean a person has active tuberculosis, but warrants further evaluation.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 279 of 304
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## **VASOPRESSIN**

### **Pharmacology and actions**

The endogenous form of vasopressin (antidiuretic hormone – ADH) is a polypeptide hormone which is produced by the hypothalamus and released by the posterior pituitary gland in response to increased plasma osmotic concentration. In addition to retaining water to rectify osmolality (through V2 receptors), vasopressin demonstrates vasoconstrictive properties which are significantly amplified at the higher doses used in the exogenous form during cardiac arrest. Vasopressin is a non-adrenergic vasoconstrictor which binds to the V1 receptors in smooth muscle. The resultant effects of vasopressin administration are shunting of blood from the skin, intestines, fat and muscle; bronchial constriction, increased blood flow to vital organs, increased coronary artery perfusion pressure, increased cerebral oxygen delivery, and an increase in the median frequency of ventricular fibrillation. The half-life of vasopressin is estimated to be 10-20 minutes.

### **Indications**

Cardiac arrest due to ventricular fibrillation, asystole or PEA

### **Precautions**

- A. Since vasopressin is not a beta-adrenergic drug, it does not increase myocardial oxygen demand during states of cardiac arrest; however, increased afterload may contribute to episodes of angina in conscious patients with a history of coronary artery disease.
- B. May cause tissue necrosis with extravasation.

### **Administration**

- A. In cardiac arrest, administer 40 U of vasopressin IV/IO.
- B. Pediatric dosage is 0.4 units/Kg IV/IO. (Use in pediatric patients only when epinephrine is not available).
- C. Repeat doses of vasopressin and/or the addition of epinephrine to vasopressin is controversial. In extraordinarily long cardiac arrest situations, seek direct physician consultation regarding vasopressor therapy before progressing beyond the above-delineated dosing scheme.

### **Side effects and special notes**

Vagally-influenced bradycardias may occur in the post-cardiac arrest period due to increased peripheral vascular constriction.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 280 of 304
---	-----------------------	--------------------------------

## **VECURONIUM BROMIDE (NORCURON)**

### **Pharmacology and actions**

Vecuronium is a short-to-intermediate acting skeletal muscle relaxant, which is used to maintain paralysis of the intubated patient. Unlike succinylcholine, it initiates flaccid paralysis by blocking receptors of the motor end plate, rather than binding to them. Effectively, this action blocks neuromuscular transmission of impulses without depolarizing the muscle. Due to the non-depolarizing nature of this drug, it has less adverse effects in relation to hyperkalemia. Vecuronium is also remarkably free of the traditional histaminic side effects that characterize most other non-depolarizing skeletal muscle relaxants. As such, there are few, if any, cardiovascular side effects with the administration of vecuronium. The paralysis induced by vecuronium is reversible by acetylcholinesterase inhibitors, such as neostigmine. Injection of vecuronium usually produces flaccid paralysis within 2–3 minutes. Effects last for 30 minutes.

### **Indications**

- A. To maintain paralysis of the intubated patient as described in the RSI protocol only after confirmation of correct endotracheal tube placement.
- B. To prevent shivering in TICE protocol patients with a confirmed tube in the trachea

### **Precautions**

- A. Contraindicated in those patients known to have a hypersensitivity to vecuronium.
- B. Patients with severe renal failure and/or hepatic failure may experience prolonged paralysis when given standard doses of the medication.

### **Administration**

- A. Paralyzing dose of 0.1 mg/kg for patients > 12 y/o.
- B. Paralyzing dose of 0.2 mg/kg for children < 12 years of age.
- C. Vecuronium can only be administered intravenously.

### **Side effects and special notes**

- A. Once given vecuronium, the patient will be paralyzed and unable to protect their own airway or breathe on their own for 30 minutes. Assure correctly placed endotracheal tube before this medication is administered.
- B. Vecuronium has no ability to sedate or relieve pain. Therefore, concomitant sedation should be administered to all patients receiving vecuronium, unless hemodynamically unstable.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 281 of 304
---	-----------------------	--------------------------------

## VERAPAMIL

### Pharmacology and action

Verapamil is a derivative of papaverine. It acts as a slow calcium channel blocker.

- A. Slows conduction and prolongs refractoriness in AV node.
- B. Slows ventricular response to atrial flutter and fibrillation.
- C. Vasodilator effect on vascular smooth muscle, including coronary arteries.
- D. Negative inotrope, which decreases myocardial oxygen consumption.

### Indications

- A. Treatment of paroxysmal supraventricular tachycardia (PSVT) in patient who does not require cardioversion and is unresponsive to adenosine.
- B. May be useful to slow the ventricular response to atrial flutter or fibrillation in symptomatic patients.

### Precautions

- A. Vagal maneuvers and adenosine are safer and should be attempted before verapamil is considered.
- B. Not for use in patients who are hemodynamically unstable with severe hypotension or congestive heart failure. Patients who appear critical with rapid, narrow complex tachydysrhythmias should be **CARDIOVERTED**.
- C. Verapamil should be used with caution or avoided in patients who are taking beta-adrenergic blocking agents.
- D. Contraindicated in patients with sick sinus syndrome or AV block in the absence of a functional artificial pacemaker.
- E. Contraindicated for atrial flutter or fibrillation in patients with history of WPW (Wolff-Parkinson-White) or LGL (Lown-Ganong-Levine) syndromes.

### Administration

- A. **Adult** – 2.5–5.0 mg slowly IV (over 2–3 minutes). May administer additional 5–10 mg if no response in 30 minutes.
- B. **Pediatric** – Not indicated for field use.

### Side effects and special notes

- A. Transient drop in the arterial pressure is expected. However, with occasional severe hypotension, treatment may be necessary. If so, considered: IV fluids, dopamine, calcium, or glucagon. Consult base physician.
- B. Electrical activity through the SA and AV nodes depends on a significant degree upon calcium influx through the slow channel. By blocking that response, patients with prior nodal disease can develop sinus arrest, third degree heart block or asystole. These complications may require: calcium, atropine, glucagon or cardiac pacing. Consult physician.
- C. Verapamil can cause severe hypotension, shock, and ventricular fibrillation when administered to a patient in ventricular tachycardia. It should not be used to differentiate PSVT from VT. When in doubt treat rhythm as ventricular tachycardia by using lidocaine.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 282 of 304
---	-----------------------	--------------------------------

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 283 of 304
---	-----------------------	--------------------------------

# **CHAPTER 9**

# **OPERATIONAL PROCEDURES**

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 284 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document #  04-2010	Rev.: Page #: 285 of 304
---	---------------------------	--------------------------------

## COMMUNICATION PROCEDURE

### Ambulance ID

- A. Call number, vehicle ID.
- B. Status or code – emergency, non–emergency.
- C. Request physician if consultation desired.
- D. Specify consultation need. ("Need drug orders, need hold, etc.")
- E. Patients – number, age, sex.

### History

- A. Basic problem or chief complaint – syncope, chest pain, auto accident with neck pain, etc.
- B. Pertinent additional symptoms – vomiting blood, short of breath, etc.
- C. Past history only if pertinent – medications, similar problems in past.

### Objective findings

- A. General status – minor injuries, shocky, near dead, etc.
- B. State of consciousness.
- C. Pertinent localized findings – lacerations, broken bones, areas of tenderness, mini–neuro exam if appropriate, etc. (only in as much detail as necessary to prepare for the patient or to direct treatment enroute).
- D. Vital signs – pulse, BP, respirations, monitor pattern if appropriate.
- E. Time course since arrival – stable, gradual deterioration or improvement, etc.

### Treatment

- A. In progress – IVs, medications, backboards, collars, splints, etc.
- B. Requests – name of attendant, specific procedure/drug request.

### Estimated time of arrival

### Special notes

- A. Communications must be brief, orderly, precise, and void of premature or unnecessary conclusions.
- B. Radio reports broadcast potentially confidential and privileged information. Use discretion. Patient names rarely need to be broadcast.
- C. The longest radio reports will usually be those where the patient is refusing care, but obviously needs care. To explain all the circumstances, what means have been tried to persuade the patients to come to the hospital, and what other attempts may be tried (including having the patient speak to the physician) will all take time. These calls are the only ones where time should be lengthy to try every means possible to persuade patients who may be frightened, ignorant, or even suicidal. The alternative of restraint and transporting patients against their will should be reserved for the most clearly incompetent and medically at risk patients.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 286 of 304
---	-----------------------	--------------------------------

### **PREHOSPITAL MEDICAL RECORDS (TRIP REPORT)**

After the call, it is important to take the time to complete a trip report which contains all of the pertinent observations from the call. There are several reasons to accurately document observations, assessments, treatments, and patient response to treatment.

- A. The first and most important reason for accurate documentation is to assure that all pertinent data has been conveyed to the receiving EMT, nurse and/or physician. This report should accompany the patient into the hospital and be available to the consultants who will ultimately provide ongoing care for the patient. Thus, it is essential to provide continuity of care. Remember, none of the in-hospital personnel will ever have access to the background information available at the scene unless it is documented in the trip report.
- B. Documentation in the trip report allows CQI activities to detect problems and reveal system successes.
- C. Finally, the accurate and detailed trip report can be the best defense against legal challenges regarding the medical care delivered in the field.

Documentation, however, should not be sacrificed for typing speed, poor handwriting, or fatigue. The written report must be considered almost as important as the care delivered.

The "SOAP" format is probably the most simple and widely used in medical reports. It is easy to learn and helps organize the thoughts of the prehospital care provider as well as organize the report. It also allows organization of the data in a manner consistent with hospital records, thus makes interpretation by physicians and nurses easier. CHART is also an acceptable form of documentation. An open narrative format is discouraged.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 287 of 304
---	-----------------------	--------------------------------

## SOAP

**"S" SUBJECTIVE FINDINGS** – What the patient complains of or "History."

- A. Chief complaint (preferably in the patient's own words).
- B. History of the present illness. (When did it start? What has happened since then? What makes it better or worse? What are the associated symptoms?)
- C. Past medical history if pertinent. (History of diabetes? hypertension? heart disease?)
- D. Medications. (What meds are they normally taking? Any new ones? Any they should be on, but ran out of?)
- E. Allergies (particularly drug allergies).
- F. Pertinent information from family, bystanders, witnesses.

**"O" OBJECTIVE FINDINGS** – What you see, hear, feel, measure, or smell, on your "Physical Exam."

- A. General description. (Awake, unconscious, comfortable, in acute respiratory distress, combative, cooperative, etc.)
- B. Vital signs. (Blood pressure, pulse, respiratory rate.)
- C. Head and neck, eyes, ears, nose, throat if pertinent. (Pupils equal or unequal, severe laceration, jugular venous distension, etc.)
- D. Chest. (Crepitance, breath sounds, etc.)
- E. Abdomen if pertinent. (Soft, tender, etc.)
- F. Extremities if pertinent. (Tender, misshaped, edema, pulses, etc.)
- G. Neurologic exam if pertinent. (Unconscious, response to voice, response to pain, oriented, etc.)

**"A" ASSESSMENT** – What do you think is the problem?

This is not a "diagnosis," but rather an assessment of what the problem is for the patient. "Cardiac arrest" does not need a "possible" with it. It is certainly appropriate, however, to list "possible" MI or fracture.

**"P" PLAN** – What will you or did you do to help the patient?

- A. Oxygen, immobilization, splinting, defibrillation, administration of medications, etc.
- B. Record the response to each treatment and where the patient was transported.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 288 of 304
---	-----------------------	--------------------------------

## CHART

**“C” Chief Complaint** – What the patient is complaining of. Also include age, gender, and weight.

**“H” History** – Subjective information received from the patient. (SAMPLE)

- A. History of the present illness. (When did it start? What has happened since then? What makes it better or worse? What are the associated symptoms?)
- B. Past medical history if pertinent.
- C. Medications. (Prescription, over the counter, diet supplements, home remedies, etc; compliance with medications)
- D. Allergies
- E. Pertinent information from family, bystanders, witnesses.

**“A” Assessment** – Objective information obtained during your physical examination.

- A. General description
- B. Vital signs
- C. Head, neck, eyes, ears, nose throat if pertinent.
- D. Chest
- E. Abdomen if pertinent.
- F. Extremities if pertinent.
- G. Neurologic exam if pertinent.
- H. Field Assessment of what you think is going on with the patient.

**“R” Rx/Treatment** – What will you or did you do to help the patient. Also document any response to the treatment you provided.

**“T” Transport** – Facility transported to, mode of transport (emergent/non-emergent), why transported to that facility (request, closest, protocol, etc).

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 289 of 304
---	-----------------------	--------------------------------

## **DETOXIFICATION CENTER EVALUATION PROTOCOL**

### **Purpose**

To provide a mechanism for the safe evaluation and triage of patients who are intoxicated, but require neither acute medical care nor comprehensive evaluation in an emergency department, so that they may more appropriately be transported to a detoxification facility for treatment, rather than to a general hospital facility.

### **Patient Population**

Patients who are currently intoxicated, have no acute medical problem and have no other resource available to them to provide an opportunity for safe detoxification.

### **Evaluation Procedure**

- A. Obtain a history that includes recent events, past medical history, recent health status, current symptoms of illness, recent traumatic episodes, recent alcohol intake, medication and/or recreational drug use.
- B. Perform a physical and mental status examination.
- C. Determine blood glucose and oxygen saturation levels.
- D. Obtain baseline vital signs
- E. Evaluate patient's ability to ambulate with only minimal assistance.
- F. Consult with Base Hospital Emergency Department for patient disposition.

### **Exclusionary Criteria**

Use currently available checklist

### **Disposition Procedure**

- A. If patient meets the criteria of the currently available checklist and physician approval obtained, transport patient directly to Detoxification Center, unless they are on divert.
- B. Complete patient care report as normal.
- C. If the status of the patient changes during transport such that the patient no longer meets admission criteria for the Detoxification Center, re-direct transport of the patient to a hospital emergency department (utilizing current protocol destination guidelines).

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document #  04-2010	Rev.: Page #: 290 of 304
---	---------------------------	--------------------------------

### **CUSTOMER SERVICE**

Customer service is the buzz word today. The concept of "Do unto others as you would have them do unto you," however, has been around for awhile. It doesn't matter how technically adept we become if the human side of medical care is lost. Patients expect medical competence, but feel better if they are cared for.

The patient calling for emergency medical assistance is even more sensitive than usual. No one gets up Tuesday and writes in their day planner book – "call 911 – 7:00 P.M., Wednesday." Whatever happened, it was not planned. People are not prepared – mentally, emotionally, or physically. The emergency intrusion into their day was not what they had in mind when they got up this morning. This makes the prehospital care provider's approach, attitude, dress, and manners critical to the interaction.

#### **Essential elements of patient oriented "customer" care (may seem similar to scouting)**

- A. Be prompt.
- B. Be neat, clean, courteous.
- C. Address patient and family by last names if possible, "Mr. or Mrs. Jones," not "Joe" or "Sally." (First name only if patient requests.)
- D. Address patients and family by "sir" or "madam" if unable to obtain or remember names or in critical patient situations.
- E. Be courteous and appropriate with other personnel. It is inappropriate to bicker with or put down other prehospital care providers in front of patient or family. If you have a problem with paramedic X or police officer Y – address it after the call. If you have recurring problems, ask a supervisor's assistance, but reach an agreement about how you will handle problems at the scene with this other person before the next call. (They should be motivated to reach an agreement, since you are not making their job easier, either.)
- F. Be neat at the scene. Do not leave bloody needles, wraps, tape or bandages, etc., lying around. It used to be sloppy, but in the time of AIDS and hepatitis, it is also dangerous.
- G. Be considerate of patient comfort. If there is no life threat then take the time to make the patient as comfortable as possible. Are they worried about their dog? Confine him and reassure patient. Are they worried about friends or neighbors? Advise those on the scene where the patient will be transported. Are they cold? or in pain? Get another blanket or administer pain medication. There may be reasons not to medicate in the field, but there are at least as many times that it is indicated. Call and confer with the physician, if in doubt.
- H. Be considerate and professional at the hospital. Give a complete patient report. If the physician or nurse seem distracted – ask if you should give the report after they have the patient settled. Sometimes you can avoid being asked dozens of questions if you wait until the hospital staff can give you their full attention.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 291 of 304</p>
---	-------------------------------	---

## **PROFESSIONAL IDENTITY**

There has been some debate recently as to whether prehospital care work is an occupation or a profession. There are many EMTs and Paramedics, however, who are too busy studying, training, or providing patient care to enter the debate. In many cases these are the professionals who set the standards others are trying to achieve. Webster defines profession as "1 – a professing, or declaring; a vocation 2 – an occupation requiring advanced academic training. . . ." Perhaps it rests with the individual. Just as the "professional" actor or writer is distinguished from the person who is "just doing their job," the paramedic who sets the example and participates at all levels is the one thought of as a "professional."

The professional frequently excels within their own employment environment. They are the supervisors, field internship evaluators, infection disease officers, or CQI consultants for their efforts. They are frequently the ones going to conferences, bringing back new ideas, and constantly asking why or why not. (This does not always make them the favorites of management.)

The professionals participate on a state and national level with organizations representing their field. The Emergency Medical Services Association of Colorado (EMSAC) and the National Association of Emergency Medical Technicians (NAEMT) are organizations that represent the interests of the EMT and Paramedic.

### **NAEMT**

The National Association of Emergency Medical Technicians was founded in 1975. It was established to be the national voice for EMT and Paramedic professionals.

In the 20 years since that foundation it has alternated between strength and weakness – growth or implosion – but it has remained the only national voice of the prehospital care professional. Its national membership has become a strength in training, public education, and discussions of health system reform.

NAEMT represents over 400,000 EMTs working across the U.S. and gives voice to their professional concerns and interests. NAEMT was instrumental in obtaining Public Safety Officers Benefits for EMTs as well as police officers and firefighters.

NAEMT has been active in developing and supporting a wide variety of educational workshops and programs. These range from the annual meetings which host thousands of EMTs and hundreds of companies demonstrating their prehospital equipment to small intensive learning experiences such as the Prehospital Trauma Life Support (PHTLS) courses.

Membership includes voting for state representatives to represent local interests at the national level. It includes a newsletter which contains current issues and educational events. It also includes a subscription to the Journal of Emergency Medical Services at a reduced rate. JEMS magazine is one of the most informative publications with the widest range of interests and topics – always on the "cutting edge."

Professionals strive to challenge themselves and to be the best they can be. Many will take the National Registry of Emergency Medical Technicians (NREMT) exam and

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 292 of 304</p>
---	-------------------------------	---

maintain registration, even if it is not mandatory for their particular job. The National Registry exam and continuing education requirements are currently the best assurance to the public that an EMT or Paramedic is a quality care provider.

**NREMT**

In 1969 President Lyndon Johnson's Committee on Highway Traffic Safety recommended that there be a national certification agency to establish uniform standards for training and examination of personnel active in the delivery of emergency ambulance service. A task force was formed that year and the National Registry of Emergency Medical Technicians had its first formal meeting in 1970. The Board of Directors was composed of representatives of the Ambulance Association of America (later to become the American Ambulance Association), International Association of Fire Chiefs, International Rescue and First Aid Association, National Ambulance and Medical Services Association, National Funeral Directors Association, National Sheriffs Association, and International Association of Chiefs of Police. These seven organizational members nominated four physicians involved in EMS to join the Board as it was established as an independent, not-for-profit, non-governmental, free-standing agency.

The first basic NREMT-A examination was administered simultaneously to 1,520 ambulance personnel at 51 test sites throughout the United States in October, 1971. Reregistration guidelines were developed for the EMT-Ambulance and the "EMT-Non Ambulance" in 1975. The development of a national training program for EMT-Paramedic led to new paramedic exams being written in 1977. The development of guidelines and examinations for the EMT-Intermediate level was completed in 1980. Continued work since then has expanded the question bases while maintaining currency of the exam as medical practice standards have changed. NREMT has also been very involved in the development of the field of prehospital practice on the national level. They have participated with the Joint Review Committee for EMT-Paramedic Education since its inception with the AMA. Most recently they sponsored the National EMS Education and Practice Blueprint. This project will directly impact the EMT-Basic update as well as updates for the other levels of prehospital care providers.

National Registration is dependent on passing both a written and practical exam. The written exam is developed in stages. The item writing committee is formed with prehospital personnel, EMS experts, and educators from across the country invited to develop questions over certain course objectives. These must all be referenced to assigned objectives with answers available in commonly used EMT textbooks. The committee then meets to review, rewrite and reconstruct drafted items. Consensus by the committee must be gained so that each question is in direct reference to the curriculum, that the correct answer is the one and only correct answer, that each distractor option has some plausibility, and the answer can be found within commonly available EMT textbooks. Controversial questions are discarded and not placed within the item banks. Items are reviewed for reading level and to ensure that no bias exists related to race, gender, or ethnicity.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 293 of 304</p>
---	-------------------------------	---

Following completion of the item writing phase, all items are then pilot tested in areas across the United States. Item analysis is completed. A Standard Setting Committee then meets to determine the pass/fail score of the examination using a criterion-referenced technique as guided by psychometric consultants. Members of the Standard Setting Committee are expert in prehospital care and may include EMT-Basics, Intermediates, Paramedics, Nurses, State EMS Directors, State Training Coordinators or Physicians. All members of the committee review every portion of a test item including the stem, correct answer and distractors. All members must agree on the construction of the question and affirm the correctly keyed answer. Following the modified Nedelsky formula, a performance index is determined for each item in the National Registry's item bank. Examinations are then developed based upon an analysis of the most frequent and critical tasks EMTs perform when providing prehospital care. All examinations are constructed to have a pass/fail standard of 70%.

The practical examination is currently based on published standards. If those standards are learned and practiced it would be difficult not to pass the practical exam. Maintenance of registration is dependent on continuing education. These standards were originally based on a "best guess" from many experts in the field, but are constantly being challenged both from within and without the Registry. There is currently planned a research project to address the issue of continuing education needs for prehospital care personnel. The issue is very difficult to sort out, as conflicting data from other medical care areas indicate.

In spite of controversy over the amount of continuing education necessary, there does not seem to be any disagreement that on-going education is necessary for all fields of medical care. National Registration, then, remains the best assurance to the public of a quality prehospital care provider.

So, is it a profession? The choice is yours.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document #  04-2010	Rev.: Page #: 294 of 304
---	---------------------------	--------------------------------

## **INFECTIOUS DISEASES**

Infectious diseases have been of increased concern for prehospital care workers over the past several years. The impetus for this concern was the Acquired Immune Deficiency Syndrome, but it has been recognized for some time that prehospital care workers were at increased risk for Hepatitis B & C, Meningitis, Tuberculosis, and most recently SARS and other more rare conditions. Since there is no way of determining which of the patients will have underlying infectious diseases, the current recommendations are for "Standard Precautions" as defined by CDC. This includes protecting the prehospital care worker from exposure to patient blood, urine, feces, etc. Routine use of good hand washing technique, and proper cleansing of equipment will decrease the risk of contamination.

### **Summary of Current Recommendations**

- A. Immunization
  1. MMR – measles, mumps, and rubella
  2. Polio
  3. DPT or DT – diphtheria, pertussis, and tetanus
  4. Heptavax or Recombivax – Hepatitis B
  5. Influenza (optional, but desirable)
- B. Gloves should be worn for all anticipated exposure to body fluids. At a minimum this includes all trauma patients, all intravenous lines, any patient who is incontinent or markedly disheveled.
- C. In order to decrease the risk of contaminated puncture wounds, blood will not be drawn, nor will tubes be filled in the field for routine patient encounters.
- D. Goggles or glasses should be worn for any anticipated splattering exposure. Masks are also recommended when possible. This particularly applies to patients needing intubation. OSHA requires use of eye protection and masks if splatter can be "reasonably anticipated."
- E. If unanticipated contact with any body substance occurs – washing should be performed as soon as possible (hands, face, etc.). Contaminated clothing should be removed as soon as possible and washed with chlorine bleach before reuse.
- F. If exposure to a patient's body fluids has occurred, agency policy should be followed. A "Suspected Prehospital Exposure Report" will be generated which will allow the Infection Control Officer of each organization to obtain details of exposure, and patient status – whether HIV, Hepatitis B, C or other tests are necessary. Follow-up may be from a personal, or "Work Comp" physician.
- G. In the event of significant exposure (deep puncture wound) to known HIV + patient, the prehospital care worker should be evaluated immediately (checked in as ED patient) by ED staff and offered drug therapy if appropriate.
- H. Tuberculin testing is recommended at least annually.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 295 of 304</p>
---	-------------------------------	---

### **INTERHOSPITAL TRANSFER**

Interhospital patient transfers on an emergency basis are commonly initiated when definitive diagnostic or therapeutic needs of a patient are beyond the capacity of one hospital. The patient is potentially unstable and medical treatment must be continued and possibly even initiated enroute. Written guidelines permit orderly transfer of patients with appropriate continuity of care. EMTALA has mandated such policies be established by each hospital. The following is a suggested protocol

- A. All patients should be stabilized as much as possible before transfer.
- B. Paramedics or EMTs must receive an adequate summary of the patient's condition, current treatment, possible complications and other pertinent medical information.
- C. Treatment orders should be given to the ambulance personnel. These orders should be in writing. Orders given by direct verbal order from the doctor who is initiating the transfer must be recorded immediately, and signed prior to transport.
- D. Any patient sick enough for emergency transfer must have at least one IV in place prior to transfer. Orders for IV composition and rate should be provided.
- E. Transfer papers (summary, lab work, X-rays, etc.) should be given to the ambulance personnel, not to the family or friends.
- F. The receiving physician must be contacted by the transferring physician prior to transfer. The base physician may also need to be contacted so that appropriate radio control of the ambulance enroute is assured.
- G. The receiving hospital, physician, and nursing personnel must be notified prior to initiation of transfer to assure adequate space and the ability to care for this patient.
- H. The personnel and equipment used to transfer a patient should be appropriate to the treatment needed or anticipated during transfer. EMTs who are not familiar with IVs should not handle emergency transfers. Paramedics should be utilized if any advanced resuscitation or treatment is anticipated. In specialized fields not ordinarily handled by paramedics (e.g., obstetrics, high risk newborns), appropriately trained personnel (e.g., nurse, physician and/or respiratory therapist) should accompany the patient.
- I. Consult Rule 500 for current guidelines.

In order to maintain these standards, it may be appropriate for the receiving hospital to send an ambulance with more specifically trained personnel to transfer the patient.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document #  04-2010	Rev.: Page #: 296 of 304
---	---------------------------	--------------------------------

## LEGAL PROBLEMS

State laws which govern emergency medical care vary. Legal problems which develop during an emergency call are best managed by direct communication between the providers and the base physician, or, ideally, between the patient and the physician. The following is an outline of basic legal principles which may be useful when no direct contact with base physician is possible.

### Consent

- A. A mentally competent patient has the right to consent to or to refuse treatment. If the patient is not mentally competent, a competent relative or guardian has this same right (see below).
- B. Consent is "implied" when the patient is unable to consent to treatment due to age, mental status or medical condition and no responsible party is available to grant that consent.
- C. In no event should legal consent procedures be allowed to delay immediately required treatment. If the time delay to obtain lawful consent from an authorized person would present a serious risk of death or serious impairment of health, or would prolong severe pain or suffering of the patient, treatment may be undertaken to avoid that risk.
- D. Age of consent varies with different states. In general, the patient must be over 18 years of age or between 15 and 18 years and "emancipated," (i.e., living apart from his or her parents).
- E. If the patient is a minor, consent should be from a competent natural parent, adopted parent, or legal guardian.

### Mental Capacity

- A. A person has appropriate mental capacity if he or she
  - 1. is able to understand the nature and consequences of his or her illness or injury,
  - 2. is able to understand the nature and consequences of the proposed treatment, and
  - 3. has sufficient emotional control, judgment, and discretion to manage his or her own affairs.

The patient should be assessed to determine that they are oriented, have an understanding of what happened, and what may possibly happen if treated or not treated, and have a plan of action –such as how to get home from scene if refusing treatment.
- B. A patient who is intoxicated, under the influence of drugs or toxic inhalation (CO poisoning), head injured, or in shock will most likely not be considered competent.
- C. If the patient does not have appropriate mental capacity under these guidelines, consent should be obtained from another responsible party – who must also have appropriate mental capacity and be legally "of age": spouse, adult son or daughter, parent, adult brother or sister, or legal guardian.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 297 of 304
---	-----------------------	--------------------------------

- D. If the patient does not have appropriate mental capacity and none of the above persons can be reached, the person should be treated and transported to a medical facility. It is preferable to enlist support and agreement in this course of action from law enforcement.

### **Duty to Act**

- A. Public and municipal ambulances have a duty to respond to all calls for aid in their response area and to render appropriate treatment. (Private services may be immune from this requirement. Volunteer services may have this duty to respond also.)
- B. The prehospital provider has an obligation to treat the patient in accordance with the standard of care to be expected from other medical care providers of the same training and skill level. If the responder does not act in accordance with those accepted standards of care and the patient suffers injury because of this, the provider may be liable for negligence.
- C. Once treatment has been rendered, the prehospital provider has the duty to care for that patient until he can transfer care to a competent health care provider who accepts responsibility for the patient (either at the scene, enroute, or in the hospital).

### **Special Notes**

- A. Failure to treat someone who needs care is a far "riskier" course than to treat in good faith with less than full legal permission. Do not let fear of legal consequences keep you from rendering such responsible and competent care as your patient has a right to expect from your medical training.
- B. The best defense against any legal question of consent, mental capacity, and the need for care, is a good MEDICAL RECORD. Your written account of the patient and care rendered will be invaluable to you if legal questions are raised months later and will convey your competence and adherence to standards of care.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document #  04-2010	Rev.: Page #: 298 of 304
---	---------------------------	--------------------------------

### **PATIENT REFUSALS**

If a patient has been contacted at a scene and he refuses to be transported, this is a REFUSAL and not a CANCELLATION. These patients should be appropriately assessed, including taking vital signs. You must document the condition of the patient. If this is not possible, state so on your trip report and give the reason. All refusals must be called in to base hospital, preferably on a recorded line. These recordings are available for a varying period of time, but may be kept indefinitely if there are any potential legal problems. The agency policy should be followed as soon as possible after any incident so that the recordings may be saved. In addition, you must document that you called in this refusal by writing on your trip report, "Hospital (specify name) notified of refusal" or "Dr. X at Hospital Y approved refusal" if there is any conflict. Document the name of the provider to which the refusal was called in to. Do not document the name of a physician if you have not spoken with them. As with medications, if you want to speak to the physician – notify the hospital immediately before beginning the radio report. EMT–Basics may do refusals. ALS personnel should be involved in the refusal process if available.

#### **The following will cover most situations**

- A. If the patient and the prehospital care provider agree no medical problem exists and no treatment is necessary, then no transport is needed. Call in refusal. This may be recorded by the nurse if they are also comfortable with the refusal.
- B. If the prehospital care provider feels no medical problem exists and no treatment is necessary and the patient feels he does need care and wishes transportation, the patient MUST be transported.
- C. If the prehospital care provider thinks the patient needs medical care and the patient does not agree, the prehospital care provider must decide if the patient is competent to make that decision.
  1. If the patient has appropriate mental capacity, he may refuse treatment. The prehospital care provider must document this on the trip report and by radio communication with an emergency physician at the base hospital.
  2. If the prehospital care provider has determined the patient does not have the appropriate mental capacity to understand the need for treatment and/or the risks of refusal, the patient may be transported without his consent. (Consider this if the patient appears to have a head injury, significant alcohol intake, altered mental status, or abnormal vital signs.) This must also be well documented.
- D. Children below the legal age of consent are not competent legally to make medical care decisions. If care is needed – transport with parents agreement. If care is needed – and no parents or relatives are available – transport and parents will be notified by the hospital. If care is needed – and parents refuse – notify legal authorities who can place the child in protective custody for medical care. If no care is needed – child MUST be left with an adult who has appropriate mental capacity. Every effort should be made to notify parent or legal guardian. Older children may appropriately be left in their own care, but consult with base physician. Call in refusal.

<p align="center"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 299 of 304</p>
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### **PHYSICIAN ON SCENE**

Physicians and prehospital care provider interactions can be very positive or very negative, they are seldom boring exchanges. These interactions will occur under different circumstances and the rules will change with the circumstances.

- A. Physicians with critical patients in their office (or other facility) call for help and transport. The prehospital care provider will be going into the personal office or facility of the physician to attend the physician's patient. The physician caring for the patient has been in charge of events to that point in time and frequently will be somewhat reluctant to "turn over" that charge position. On the other hand they are also frequently quite anxious to get the patient out of their facility, so they may seem quite torn by this dilemma. The easier the prehospital personnel make this transition, the better it will go. Try to get as much of the history as possible while actually loading the patient. IV access may already be accomplished or may need to be performed at the scene or enroute. If the physician is anxious to get the patient out the "Load and Go" mentality may be evident. If that is the case try to start IV access enroute.

If the patient is in cardiac arrest, the initial approach will need to be accomplished in the physician's office. This will probably be the most difficult situation to accomplish smoothly. Most physicians will not be able to just "stand back" and let the prehospital personnel run a cardiac arrest in their office. If the physician is helpful – please let them help! If the physician is interrupting procedures, demanding drugs you don't carry, or otherwise obstructing the scene – request that he or she contact the base physician for assistance with their needs. If necessary, transport the patient and perform procedures enroute. That attending physician will be considered legally in charge of their patient in their facility.

- B. The physician who "stops by" at the scene is in the role of a "Good Samaritan". They have no established relationship with this patient (unless they advise you otherwise). These physicians also, may be of great assistance or great annoyance. When treated with respect and asked for specific assistance they will most likely be quite helpful. If there is a confrontation, however, this physician most likely has no legal authority on the scene. If this is an auto accident or other public incident the scene commander will be spelled out in city/county statutes . . . and it will not be a physician. If necessary, they can be forcefully removed from the scene, but someone's diplomacy rating must be quite low to ever get to that level of action.
- C. El Paso County Medical Society has directed "that a physician wishing to take responsibility for a patient on the scene must identify him/herself as a physician and should be able to show his license; otherwise prehospital care providers are obligated to continue their treatment of the patient. If the physician assumes responsibility for the patient, it is his/her responsibility to stay with that patient until reaching the hospital, preferably in the transporting vehicle. If a physician on scene insists on assuming care, ask to see their license and have them sign the form accepting responsibility (next page).

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 300 of 304
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<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 301 of 304
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**PHYSICIAN RESPONSIBILITY AT THE SCENE**

The Emergency Care Committee of the El Paso County Medical Society would like to remind all members of the society that a physician wishing to take responsibility for a patient on the scene must identify him/herself as a physician and should be able to show his license; otherwise, prehospital care providers are obligated to continue their treatment of the patient. If the physician assumes responsibility for the patient, it is his/her responsibility to stay with that patient until reaching the hospital, preferably in the transporting vehicle.

As a physician who plans to assume care of this patient, I understand that the prehospital care providers are acting under standing orders and are performing under the license of their physician advisor. I feel that I can provide care to this patient which is more beneficial than that available through the prehospital care system of EMTs and Paramedics. I request, therefore that I be allowed to assume care and I agree to accompany the patient to the hospital.

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Signature

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Please print name

Tear this form out and transport with the patient to the hospital.

<p style="text-align: center;"><b>Paramedic Protocol Guidelines El Paso County Edition</b></p>	<p>Document # 04-2010</p>	<p>Rev.: Page #: 302 of 304</p>
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**PHYSICIAN ORDERS FOR EXTRAORDINARY CARE THAT ARE NOT COVERED UNDER CURRENT PROTOCOL**

**Purpose**

On-line medical control provides for both the transmission of information, between the paramedic that is at the patient's side and the physician that is currently responsible for the care of the patient, and for physician-directed care that the paramedic should provide in the best interests of the patient.

Paramedics are by definition physician-dependent practitioners that rely on written protocols for off-line medical control and to define our scope of practice. The written protocol that a Medical Director approves and the training that a paramedic has received defined by the Rule 500 for paramedics in the State of Colorado. Unfortunately, protocols can never be written which anticipate all potential situations that may arise in the field, the unique presentations of many patients, and the ever-changing standards of medical care. This protocol is meant to allow for these realities of paramedic practice and to provide a framework by which these situations are to be handled.

Care which is provided to a patient that is outside the parameters of the current protocols shall be categorized as a variance

**IN NO EVENT CAN THE VARIANCE EXCEED THE COLORADO STATE ACTS ALLOWED**

**Variance Examples**

The physician directs the paramedic to provide a medication, administer a dose of a medication, and/or, administer a medication by a route that is commonly acceptable, but is not currently written into the protocol in the manner in which it was ordered.

OR

The physician directs the paramedic to perform a procedure that they are familiar with, and/or have been trained in, but it is currently not written into the protocols, or is not written into the protocols in the manner in which it has been ordered.

**A PROTOCOL VARIANCE REQUIRES THE SIGNATURE OF THE AUTHORIZING PHYSICIAN ON YOUR PATIENT CARE REPORT. AT THE CONCLUSION OF THE CALL NOTIFICATION TO YOUR MEDICAL DIRECTOR IS REQUIRED. A COPY OF YOUR REPORT MUST BE TURNED INTO THE MEDICAL OFFICE AT THE CONCLUSION OF YOUR SHIFT.**

With any variance, the paramedic has the responsibility of notifying the consulting physician that the order that is being given is not covered elsewhere in the protocols and will only be covered under the "Extraordinary Care" protocol. The paramedic also has the responsibility to decline to perform the order if he or she does not feel comfortable in carrying out the order correctly or does not believe that it is absolutely necessary to maintain the life/health of the patient.

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 303 of 304
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### ABBREVIATION KEY

ABC = airway, breathing, circulation  
 ACEP = American College of  
 Emergency Physicians  
 ACLS = Advanced Cardiac Life Support  
 ACS = American College of Surgeons  
 ALS = Advanced Life Support  
 ATLS = Advanced Trauma Life Support

BLS = Basic Life Support  
 BP = blood pressure  
 BVM = bag–valve–mask

C = Centigrade  
 CC = chief complaint  
 CCU = coronary care unit  
 CHF = congestive heart failure  
 CNS = central nervous system  
 CO = carbon monoxide  
 CO<sub>2</sub> = carbon dioxide  
 COPD = chronic obstructive pulmonary  
 disease  
 CPR = cardiopulmonary resuscitation  
 CQI = continuous quality improvement  
 CSF = cerebrospinal fluid  
 CSM = carotid sinus massage  
 C–spine = cervical spine  
 CVA = cerebrovascular accident (stroke)

DOT = (U.S.) Department of  
 Transportation  
 D5W = dextrose 5% in water

ED = Emergency Department  
 ECG = electrocardiogram  
 EMD = electromechanical dissociation  
 EMS = Emergency Medical Services  
 EMT–B = Emergency Medical  
 Technician, Basic  
 EMT–I = Intermediate Emergency  
 Medical Technician (By DOT  
 standards)

EMT–P = paramedic, or Emergency  
 Medical Technician–Paramedic  
 ET tube = endotracheal tube  
 ETA = estimated time of arrival

F = Fahrenheit

g = gauge (diameter)  
 GCS = Glasgow Coma Scale or Score  
 Gm = gram  
 GSW = gunshot wound  
 gtts = drops

HMRT = Hazardous Materials Response  
 Team  
 Haz–Mat = Hazardous materials

I.C.S.= Incident Command System  
 ICS = intercostal space  
 ITLS = International Trauma Life  
 Support  
 IV = intravenous  
 IM = intramuscular  
 IO = intraosseous

J = Joule

L = liter  
 LMP = last menstrual period  
 LOC = loss of consciousness

MAST = medical anti–shock trouser  
 MCL = mid–clavicular line  
 mcg = microgram  
 meds = medications  
 mEq = milliequivalent  
 mg = milligram  
 MI = myocardial infarction  
 min = minute  
 ml = milliliter  
 MS = morphine sulfate

<b>Paramedic Protocol Guidelines El Paso County Edition</b>	Document # 04-2010	Rev.: Page #: 304 of 304
---	-----------------------	--------------------------------

NAEMSP = National Association of  
 Emergency Medical Services Physicians  
 NAEMT = National Association of  
 Emergency Medical Technicians  
 NG tube = nasogastric tube  
 NPO = nothing by mouth  
 NREMT = National Registry of  
 Emergency Medical Technicians  
 NS = normal saline  
 NSR = normal sinus rhythm  
 NTG = nitroglycerin

v. fib. = ventricular fibrillation  
 v. tach. = ventricular tachycardia  
 VS = vital signs

WNL = within normal limits  
 W-sec = watt-second (joules)

O2 = oxygen  
 OB = obstetrical  
 OD = overdose

P = pulse  
 PAC = premature atrial contraction  
 PALS = Pediatric Advanced Life  
 Support  
 PCC = Poison Control Center  
 PE = pulmonary edema or pulmonary  
 embolus  
 PEA = pulseless electrical activity  
 PHTLS = Prehospital Trauma Life  
 Support  
 PSVT = paroxysmal supraventricular  
 tachycardia  
 PTV = percutaneous transtracheal  
 ventilation  
 PVC = premature ventricular contraction

RL = ringer's lactate  
 RLQ = right lower quadrant  
 RR = respiratory rate  
 RUQ = right upper quadrant

sec = second  
 SL = sublingual  
 SOB = shortness of breath  
 SQ = subcutaneous  
 synch = synchronous (switch on  
 defibrillator)  
 TIA = transient ischemic attack  
 TKO = to keep open (minimum IV rate)